Title page & Index in part 1. 2

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AMERICAN MACHINIST

A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION.

ISSUED WEEKLY BY THE AMERICAN MACHINIST PRESS,

Vol. 22. 218 WILLIAM STREET, NEW YORK. No. 27.

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NICHOLSON FILES

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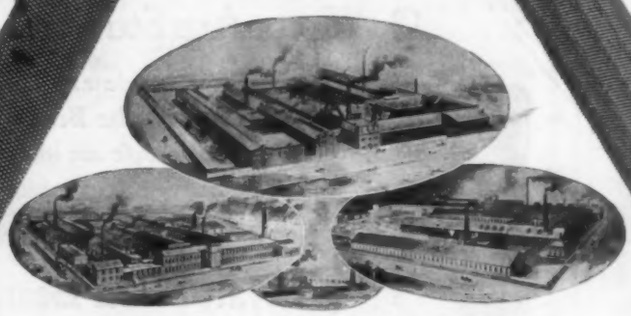

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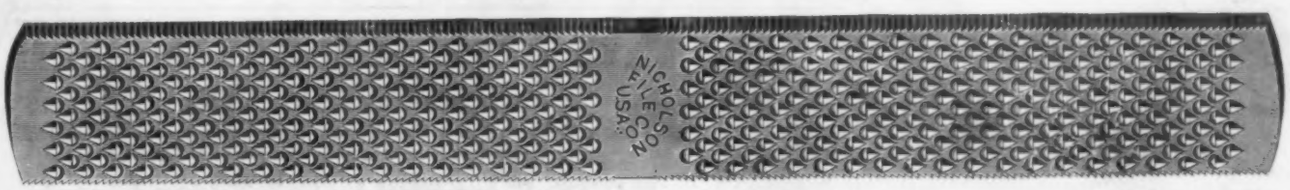

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SAM'L M. NICHOLSON, PRES'T AND GEN'L MGR.

Largest File and Rasp Producers in the World.

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doesn't lie in the use of one drop where two are needed, nor in the use of the cheapest oil. Neither of these would be economy. Real economy in the use of oil lies in using good oil and using it over and over until its goodness is gone. How can you use it over and over? By the use of a Roper Centrifugal Oil Separator, which separates oil from bolts, nuts and scraps of all sorts.

There's nothing experimental about this method of reclaiming oil—it passed that stage about seventeen years ago, and is now proving its usefulness in the best machine shops in the country.

You can't afford to be without a Roper Separator if you use as little as three barrels of oil per year. Send for full particulars.

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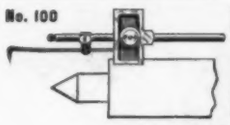
Founded 1845.
Incorporated 1864.

No. 100



New Surface Gauge

Perfect Adjustment. Unequalled Scope.

Price with 6 and 10 inch spindle, $2.50.

MADE BY THE

SAWYER TOOL CO., Fitchburg, Mass.

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of Jacks. A few are good, some are bad and some are indifferent. The Jacks that Henderer makes belong in the first-class; and though we say it who perhaps should not, Henderer's is one of the very best of the few that are good.

No poor materials ever get into a Henderer Jack,—no careless or unskilled workman has a hand in the making.

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85 Maryland Ave., Wilmington, Del.

A. W. Secor, Agent, 123 Liberty St., New York.

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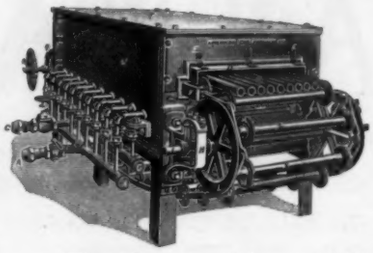

to anneal steel tubing or shafts, and it's the most successful machine that has been devised for that use.

The first machine of this kind we designed for the McCool Tube Co., of Beaver Falls, Pa., to operate with natural gas. That company soon ordered three more and explicitly specified that we were "to build the same exactly like the first in every particular."

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Want our catalog of Fuel Gas Plants?

Chas. Churchill & Co., London. H. Glaenzer & Perreaud, Paris. Schuchardt & Schutte, Berlin, Cologne, Vienna.

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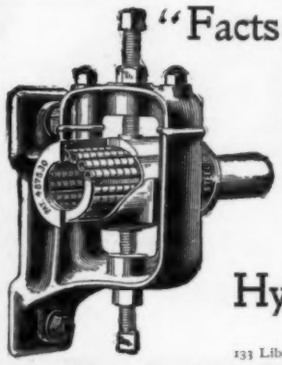

Some people are like facts.
Hyatt Roller Bearings are flexible.
Some people are like Hyatt Roller Bearings.
They yield to reason.

Read the reasons in the Hyatt Book.

Hyatt Roller Bearing Company,

HARRISON, N. J.

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HUNDREDS IN USE.

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The Cushman Chuck Co.

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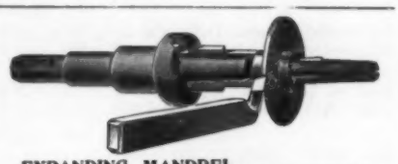

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Send for "Catalog A." Full line of Machine Tools.
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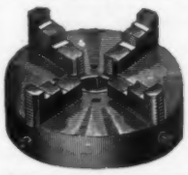

Skinner Chucks.

Independent and Universal Chucks, Combination Lathe Chucks with patent reversible jaws, Drill Chucks, Planer Chucks and Face Plate Jaws.

Skinner Chuck Co.,
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Machinery for Making Wood Screws. . . . .

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to get a good drill chuck as to get a poor one, and it's a lot cheaper in the end. The "Reid" is a good Chuck.

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The Sweetland is the Best

Combination, Simple, Accurate.
Independent, Solid Shell, Solid Reversible Jaw.
Geared Scroll, with Solid Reversible Jaw.

Hoggson & Pettis Mfg. Co.
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On Old Turret Machines,

where the turret holes are out of line with the spindle, the Pratt Positive Drive Chuck is invaluable, because it enables you to get perfect work from an imperfect machine, and prolongs the life and usefulness of that machine.

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THOSE AS IS CALLED
DROP
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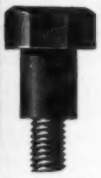

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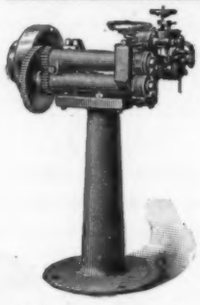

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Presses and Dies, Sheet Metal and Wire Working Machinery. Special Machinery for Manufacturing Bicycles.

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Errington

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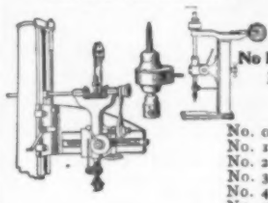
Tapping Chuck

Drives tap in, stops automatically at bottom of hole and backs tap out (quick return) without stopping or reversing drill press spindle.

Either Friction or Positive Tool Holder.



Fits Socket of ANY Drill Press.
No Backing Belt.
No Special Taps.
No Extras.

No. 0 taps 1-16 to ¼.
No. 1 taps ¼ to ⅝.
No. 2 taps 5-16 to 1.
No. 3 (pipe) taps ⅜ to 1.
No. 4 taps ⅜ to 1¾.
No. 5 taps ½ to 2.

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Drill Press Turret

Tools changed and friction adjusted while spindle is rotating without danger to operator.

Drills the hole, taps it and then sets the stud in, all without stopping or reversing drill press and without moving work.

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Pulley Moulding Machines, Pulley Lathes.

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No Special Drills, No Special Taps Required.

No More Broken Taps

The Fulmer Drilling and Tapping Attachment drills and taps holes, either through or bottoming, without reversing or stopping machine. Fits drill press same as any Taper Shank Chuck, and requires no change in mode of feeding spindle. When tapping, to reverse, it is only necessary to take hold of the handles, and it comes up with a quick return. Send for full details.

THE UNION TIRE CO., Plainfield, New Jersey.

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AMERICAN MACHINIST

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The Automatic Protection of Excellence.

When it became evident to everyone that the manufacturers of Great Britain and of the Continent had begun to realize the necessity of possessing themselves of the advanced mechanical facilities which have their growth on this side of the water, and when the various leading builders were making their earlier shipments of automatic and other machine tools, there were many who believed that no permanent trade would or could be developed. The machines might be all right, might be successful in every way and find full appreciation and employment, but they would, therefore, at once, it was said, be reproduced and imitated to such an extent that the trade would not be worth looking after.

No such thing has resulted, or will or can result. The tools that find fair treatment find also full appreciation, and with the appreciation also comes the continued and the augmented demand. Those who have suggested the possibilities of foreign imitation know well enough that imitators do not generally or permanently flourish on this side of the water, and there is no reason why they should be more successful elsewhere. Aside from the fact that the British and foreign manufacturers are all too busy in legitimate and familiar lines, so that they could not if they would engage in the extensive reproduction of American tools; they also would not if they could because it could not possibly pay to do so. He who makes the best, especially in machine tools, need have no fear that he cannot hold his own. Quite independent of all geographical conditions, it is an absolute fact that no copy or imitation is equal to the original. While in some lines, imitations, or, rather, counterfeits, are cheaply made, the fairly approximate imitations of good machine tools can never be built as cheaply as the originals, while to secure sale they must be sold considerably cheaper. If the original builder is progressive, as he must of necessity be, no copier of his product can keep up with him, but must always be reproducing abandoned or superseded types or details.

The specialization of product, which is one of the features of American manufacture, the limitation of the individual establishment to the production of one or two machines in one or two sizes, and the securing of an extensive and constant demand for these constitute an enormous advantage and a highly effective protection. It redounds also to the advantage of the customer, for the protection is only complete when the selling price is reasonable. This exclusive manufacture of a limited line of product gives the manufacturer first of all an advantage in the purchase of his material. By long experience he has found what is best for each part, and where to get that best, and buying in large quantities he can secure figures which the little and transient customer cannot approach. In many cases his material is specially made to his order, and comes to his tools in shape and condition precisely as he wants it, so that there is less waste of both time and material in working it up than if the crude stock which the other customer must content himself with was employed. Then all through the process of manufacture special tools and methods grow up with the job, cheapening and expediting the production at every step, but, more important still, also securing greater accuracy and uniformity and better finish. Not only are special tools employed, but the establishment comes to have also its special men, who have been sifted and trained, each to his precise part of the work. After this there develops around the work a system of inspection which knows where to look for the defects in the details and in the complete machine, and which enforces throughout a predetermined standard of excellence. If the imitator does not see beforehand the helplessness of his attempt he must learn it eventually. Some who have at different times attempted to build and find a market for reproductions of well-known makes of machines have served as excellent advertisers of the originals, simply provoking comparison and investigation. The customers who have occasionally been inveigled into the buying of machines cheaply made from stolen designs have learned that "honesty is the best policy" applies nowhere more pertinently than to the function of selection and purchase.

Liquefied Hydrogen.

Now that hydrogen has been liquefied there seem to be no more worlds to conquer in that special direction. It was a remarkable coincidence that the first public exhibition of this latest wonder was made in connection with the centenary of the Royal Institution of Great Britain. Professor Dewar in opening the exhibition, spoke of liquid hydrogen as a new instrument of research, which it eminently is by virtue of the extremely low temperature at which alone it can exist, and which low temperature it, by its presence or contact, enables other substances approximately to reach. The liquid was exhibited in a state of gentle ebullition in a vacuum tube immersed in liquid air, the latter serving to impede the access of heat. The hydrogen is a transparent liquid, and besides being the coldest, is also the lightest liquid known. A cork drops immediately to the bottom of it. At the bottom of the vessel containing the liquid there appeared a whitish substance, which was in fact solid air, or air ice. It is impossible to avoid the air ice in the bottom of the vessel, as the air at the surface of the liquid is, by the intense cold, condensed, liquefied and subsequently solidified, and being so much heavier than the hydrogen, it sinks and accumulates at the bottom.

To show that the liquid was really hydrogen, a light was applied to a small quantity, which at once burst into brilliant flame. Solids immersed in the liquid long enough to attain the same temperature were, upon being taken out, covered

with liquid air, which would run down and drop off.

Professor Dewar said that the temperature of the liquid was 21 degrees (Cent.) on the absolute scale, or 252 degrees below the freezing point or zero. This is 421 degrees, Fahr., below zero. It had taken nearly a year to come to a conclusion as to the temperature, as the different styles of thermometers employed gave such different results.

Concerning the immediate value of liquid hydrogen in the laboratory, Professor Dewar called attention to the high vacua which it makes it possible to attain. One end of a closed tube was immersed in the liquid for a short time and it was then sealed off at the middle, when a vacuum was formed in the upper part which was practically perfect, as the electrical charge could not be made to pass.

Professor Dewar claimed that the liquefaction of hydrogen was a triumph for theory not less than for practice. Lord Kelvin, in moving a vote of thanks to Professor Dewar, said that if those present wished to measure the importance of the occasion, they should consider what Count Rumford, or Davy, or Faraday would have thought if they could have been present. They could not have hoped for their scientific dreams and prophecies to be so splendidly verified within the century.

Our Locomotives Not Admired.

A friend who is "on the other side" sends us a leaf from "The Railway Magazine," in which is a cut of the engine referred to, and the following comments:

"They have arrived at last, and below is an illustration of one of the ungainly assemblages of iron, etc., that will do duty on the Midland Railway as a goods locomotive. Being an adaptation of American principles of construction to meet the exigencies of an English railway that awoke one day to find it was urgently in need of additional locomotives, it is not surprising that in 'No. 2501' and her sisters are reproduced the worst features of home and American design. So far as appearances go, these are evident in a sandbox placed on the boiler barrel (a position long abandoned by enlightened British locomotive designers. It will be seen that a small sandbox, for use when running tender in front, is provided below the frames). Then we have the pony-truck, and the staying of the buffer-plate to the sides of the smokebox, outside cylinders, valve chests, etc., and 'rockers' to take the motion from the eccentrics. An extended cab is provided, and the tender is supported on two four-wheel bogies, which do not appear necessary for so short a tender.

. . . . . .

"So far as appearances go, no comparison can be made between the neat engines designed by Mr. S. W. Johnson for the Midland Railway and the uncouth machine 'made in America.' Indeed, it will be observed that the builders describe the engine as a 'mogul,' an Americanism, which can in this case be freely (and appositely) translated *'mongrel,'* which aptly describes the Midland Railway's '2501' type of engines."

In answer to an inquiry, our correspondent, Mr. Chas. Vickers, informs us that the lycopodium powder mentioned in a recent article of his can be obtained of any druggist in this country.

Commercial Review.

NEW YORK, FRIDAY EVENING,
June 30, 1899.

MACHINE TOOLS.

Still the tool building shops are straining to highest tension of industry. Moreover, the sales offices are sending them in new orders with but trifling abatement, if any, and the end of the boom is not yet in sight. Absolute quietness of summer is a thing unheard of this year, and there is little even of relative.

In a previous number of this paper mention was made that the M. Sergey Friede Company was buying machinery and tools for railroad purposes in the far East. Although their contracts have not all yet been closed, purchases have been made which amount to some $150,000. The machinery is intended largely or entirely for the temporary machine shops now being built at Harbin, Manchuria, on the Chinese Eastern Railroad. The Niles Tool Works Company largely supplies the metal-working machinery. The following statement by a newspaper reporter may furnish some indication of the nature of the Niles contract and a little amusement as well: "Several 24, 18, 16 and 14-inch engine lathes; a monster car lathe, weighing about 42,000 pounds; 16 and 14-inch shapers, double axle lathes of various sizes, large vertical boring mills, double steam hammers, 24-inch planers and a number of grinding and polishing lathes, tool grinders and hand and portable twist drills." The contracts came through the Friede Company from engineers of the road who were in New York.

Among the larger June contracts for machine tools have been those let by the General Electric Company with two or three of the New York dealers for miscellaneous tools. These were in great part intended for the replacement of old machines. One dealer received an order for about thirty tools, and another got a contract for as large or a larger valuation. All told the orders amounted to $30,000 or $40,000.

Boring and turning mills are in lively demand at present. One company mentions turret machines also as a line for which it is having much call. Planers have been hard to get for a long time. It is rumored that a foreign sales firm which represents some of the most prominent American planer manufacturers has found it so difficult to get enough planers through its regular connections—deliveries being as remote on small planers as on large ones—that it was contemplating the necessity of going into the open market to supply the deficiency.

One of the best known German companies dealing in American machine tools has made in the fiscal year just closing a turn-over more than half a million dollars in excess of that for the previous fiscal year. This represents an increase of nearly 25 per cent.

A visit paid to the machine tool manufactories of Newark, N. J.—Gould & Eberhardt and the Newark Machine Tool Works—shows tool building in that town to be no less active than elsewhere. The former firm is working day and night, and is enlarging its plant nearly 50 per cent. The latter has on hand a contract for ten horizontal boring machines for the Westinghouse Electric & Manufacturing Company. The Westinghouse company has several machines of this make already in use, and they are said to have given high satisfaction. We learn that the Westinghouse company has lately done other buying in the New York district, including six big turret lathes, which have been delivered.

The Brown & Sharpe Manufacturing Company, Providence, R. I., is erecting a considerable addition to its factory. The number of men on the pay-roll has grown to about 2,000.

A local company has recently sold some large planers and boring mills, to be shipped to Germany and Russia. An 8x8x20-foot Pond planer will be among them.

An order lately placed in this market by the Columbia & Electric Vehicle Company, Hartford, Conn., calls for six big turret lathes.

Have machine-tool manufacturers in many cases been annoyed by their foreign agents selling tools at such prices as to make exorbitant profits for themselves? One company has had that experience, and as a result it is now selling direct to buyers where possible.

The Standard Tool Company, Cleveland, Ohio, has for some time past been carrying on, in addition to its twist drill and other lines, a manufacturing business in seamless steel tubing, electric welding of bicycle parts, and general welding. It has now been found convenient to separate these from the other branches of work, and in order to do so the Standard Welding Company has just been formed under practically the same proprietorship as the Standard Tool Company. It is understood to be the plan of the latter to use the present welding shop for the increase of its facilities in regular work, while the Standard Welding Company will probably erect a new factory.

A strike which existed for five weeks at

the factory of Baker Brothers, Toledo, Ohio, is at an end, and the works are now running night and day, as they are well filled up with orders. During the delay not a single order was cancelled by customers. It has been settled that the shop shall not become a strictly union one, which was a leading point at issue. Some advances in wages have been allowed, and things bid fair to go on smoothly.

Manufacturers of twist drills have so changed discounts as to make a net advance of price of about 5 per cent. This is stated to be intended as a partial compensation for the increased cost of raw material.

PRICES AND EXPORT TRADE.

The upward movement in prices of machine tools has not ceased. One of the oldest Worcester companies has just announced a reduction of discount from 35 per cent. to 30. A concern near New York this week advanced prices about 5 per cent. to some of its foreign customers.

In the opinion of sellers export trade will be injured by radical increase of prices. Machine tool builders have not yet arrived at the point where foreign orders are an insignificant factor in their prosperity. According to the estimate of one credible authority, about 50 per cent. of the work now going through machine-tool shops is for export, and in spite of the much vaunted home demand the shops would be in a hard way if they lost their foreign patronage. On more than one occasion reference has been made in these columns to the poor policy that would be displayed in intemperate advances. It is only fair to say, however, that as yet we have seen no signs that machine-tool export trade has been materially affected through such or any other cause. The best class of foreign buyers do not take fright at an advance of 10 or 15 per cent. when there is quality in the goods. Long deliveries seem to have been more of a hindrance to export trade than have prices.

This is an era of commercial marvels, and the only philosophic attitude for a man to take is to be surprised at nothing. When the sharp increases in pig iron turned up and punctured export sales like a tack in a pneumatic tire one might have supposed that we were done sending iron across the ocean, and the further advances that have taken place have had a tendency to confirm that view. It appears, however, that this line of business is going to revive. There is a shortage of iron in Europe as well as in the United States, which causes an urgent demand upon us from that source, but because our prices have outstripped theirs American producers have not found it profitable to accept many orders, although some have been taken at a concession. But now the European quotations have so nearly come up to ours that it is thought export orders could be taken at full domestic prices if sufficiently early deliveries could be made, and it looks as if foreign buyers may soon be taking up all the iron we can spare on our own terms. More than 22,000 tons are said to have been sold in the New York market this week for export to Europe. The dependence of other countries upon this one for iron supply is getting to be more than a spasmodic phenomenon, and unless conditions abroad materially change, American furnace men may feel assured of a strong support to fall back upon whenever they are compelled to retire somewhat from their present strained position of demand and price at home.

FOREIGN ITEMS.

Advices have been received here that Tosi & Co., Legnano, Italy, engine builders, boiler makers, etc., are to be converted into a joint stock company and will increase the capacity of their works. About August they are expected to invest upwards of $75,000 in new tools, machinery, shop equipment, foundry supplies, etc.

The Midi Railroad Company, of Bordeaux, France, is said to be expecting to send out specifications and drawings for a large electrical plant for lighting the railroad station and work shops, and to operate machine tools at the works. The generating plant will comprise four steam dynamos of a capacity of 285 kilowatts. The plant, it is estimated, will cost about $180,000, and the officials of the road are anxious that it should be completed early next year. It is thought that American manufacturers may be able to secure a good proportion of the contracts.

For the Natal Government railways twenty-five locomotives and other rolling stock have been ordered of British builders. Four American manufacturers, it is said, put in bids on these engines.

MISCELLANEOUS.

The Bethlehem Steel Company has succeeded to the Bethlehem Iron Company. June 26 the former company took over the property of the latter, the works, etc., being acquired by lease. The new company has a capital of $15,000,000, as against $5,000,000 of the old. New branches of manufacture will probably be undertaken and a more energetic policy adopted. Practically the same personnel is in control, but the positions are changed somewhat. The officers of the Bethlehem Steel Company are: Robert P. Linderman, president; Edward M. McIlvain, vice-president; Abraham S. Schropp, secretary; C. O. Brunner, treasurer; R. W. Davenport, general superintendent; Owen F. Leibert, chief engineer; Charles P. Coleman, purchasing agent.

The Whiting Foundry Equipment Company is now furnishing more cupolas than at any previous time in its history. The company has lately received an order from the McCormick Harvesting Machine Company, Chicago, for four No. 9 cupolas, each having a capacity of eighteen tons per hour. These are in addition to two similar cupolas installed some months ago, and constitute, it is stated, the largest melting plant of any foundry in the country. The Whiting company has also furnished the Pennsylvania Railroad Company with one of its No. 10 cupolas for the Altoona shops, and will soon make shipment of a No. 5 cupola to the Westinghouse Brake Company, St. Petersburg, Russia.

Among recent orders for dynamos and motors received by the C & C Electric Company from engineering works are the following: Belt-type generator, 80 kilowatts, for Lobdell Car Wheel Company, Wilmington, Del.; 33-kilowatt generator, to go on Imperial engine, for Rand Drill Company, Sing Sing, N. Y.; plant for shops of Cumberland and Pennsylvania Railroad, Mt. Savage, Md., including 60-kilowatt generator, to be direct connected to Dick & Church engine, large marble switch-board and 40 horse-power in different sized motors for driving line shafting; three 10 horse-power motors to go on conveyors of the Link Belt Engineering Company for use on the Trans-Siberian Railway; a 35-kilowatt belted dynamo and 47 horse-power of motors for the Frick Company, Waynesboro, Pa. A model plant for the residence of Walter Jennings, Cold Spring Harbor, L. I., N. Y., has also been contracted for. It will include a 25-kilowatt dynamo to be driven by gas engine, a handsome switch-board and five motors for operating pumps, feed cutters, etc.

CHICAGO MACHINERY MARKET.

Quite a perceptible improvement in demand for power is noticed from municipal buyers. For this increased activity the growing apathy of the industrial stock market is largely responsible. Several months ago all the surplus funds of the country were apparently going into the industrial securities, but since the darkened optics of that market have become visible a hunger for municipal bonds has sprung up as a safety valve for rising bank accounts. Contractors, appreciating this yearning, have not been slow to push the merits of water and electrical lighting plants upon the city fathers of every promising municipality in the land. The results of this missionary work have reached the engine and the boiler builders and incidentally benefited many other people by way of increased business opportunities.

Urban growth is also a most important feature in the present era of power activity. Street railway companies which a year or two ago had provided for their supposed power needs for a decade to come have since made extensions so rapidly that a complete revision of their plans has already become necessary. They are outgrowing their power as rapidly as a boy outgrows his Sunday clothes. The

former development makes activity for the engine builders and accounts in part for the fact that some of the larger plants are filled with work for eighteen months ahead and are constantly getting deeper and deeper in the sea of obligation. Projects for lines between cities are increasing very rapidly.

In the line of electrical railway development there are inquiries in the market for engines of 8,000 horse-power. But the demand is not principally for this high-power machinery. It is impossible to specialize the field where there is increase, for it comes from everywhere. It cannot be learned here that there is anywhere a large engine or a boiler builder who is not running full time and crowded with work. Among some of the little builders there is enforced idleness, owing to an inability to procure material. Last week large boiler makers were approached by some of the smaller manufacturers, who could not obtain material, with offers to do work at less than the cost of production at the larger shops. The small makers say they cannot get material and want to do something to keep their men from scattering. The market for old boilers and engines is as much above the normal degree of activity as that of new power. Manufacturers who cannot obtain the new engines they need prefer in many instances to buy second-hand rather than wait their long turn for the power. Several weeks ago the market looked like slackening up a bit. Demand has since taken a fresh start and does not now differ from its impetuosity of several months ago. The higher prices caused a gasp or two, but are not now an obstacle in trade.

The Detroit & Northwestern Railway Company has purchased from the E. P. Allis Company three 26x48 600 horse-power engines. The Southwestern Missouri Electric Railway Company has purchased a 1,200 horse-power engine within a few days. There are inquiries in the market for engines from several malleable iron plants in this territory.

Quotations.

NEW YORK, Monday, July 3.

Iron — American pig, tidewater delivery:—

Pennsylvania irons:	
No. 1 X foundry	$19 25 @ 20 00
No. 2 X foundry	18 25 @ 18 75
No. 2 plain	17 50 @ 18 00
Gray forge	16 50 @ 17 00
Alabama irons:	
No. 1 foundry	18 75 @ 19 25
No. 2 foundry	18 25 @ 18 75
No. 3 foundry	17 75 @ 18 25
No. 1 soft	18 75 @ 19 25
No. 2 soft	18 25 @ 18 75
Foundry forge	16 75 @ 17 25

The pig iron market is very irregular and some quotations are made in excess of those given.

Bar Iron—Base sizes—Mill price for refined in carloads on dock, 2.20c., upward; from store, 2.25c., upward. Common, from store, 2.15 @ 2.20c.

Copper—Carload lots, Lake Superior ingot, 18⅛ @ 18½c.; electrolytic, 17¼ @ 17½c.; casting copper, 17 @ 17¼c.

Pig Lead—Carload lots, 4.45 @ 4.50c., f. o. b. New York.

Pig Tin—Higher. As we go to press one broker quotes 27¼c., f. o. b., which is perhaps excessive.

Spelter—Prime Western, in carload lots, 5⅞ @ 6c., New York delivery.

Antimony—In cask lots and over, Cookson's, 11c.; Hallett's, 9.85 @ 10.00c.

Lard Oil—Prime city, ice pressed, 41 @ 43c. for the leading brand, in wholesale lots.

Die Making—Gang Washer Tool.

BY CHAS. C. CANDRIAN.

The several recent articles in the "American Machinist" on dies and die construction have been quite novel and instructive, and go to prove what an astonishing number and variety of dies have been gotten up, at one time or another, in one shop or another, for use in connection with power presses of different descriptions. There is no question but that we tool-makers have read with interest what has been submitted in the different letters from practical men, although we may disagree as to some of the details.

I submit the accompanying sketch of a set of gang washer tools, which is one of the many methods I have very often seen used for punching out washers from sheet metal, varying from No. 10 to No. 28, B. & S. gage. Referring to Fig. 1 in the sketch, *A*, *B* and *C* represent three views of the cast-iron "punch back." *P'* is the piercing punch, and *P* is the blanking punch. In Fig. 2, *E*, *F* and *G* show three views of the tool-steel piercing and blanking die. Fig. 3 represents a piece of a strip of stock as it would appear after being taken from the die. The cast-iron "punch back" is held in the punch holder of the press by means of a tapered key, and also the die is held in place in the die-bed by the same means. We always harden and temper the die, but, in the case of the punches, we sometimes harden them, while many times we leave them soft, which of course depends on the work they are to perform. The method best suited in either case is simply a matter of skill and good judgment.

The next question for consideration is the method we use in place of the guide or pilot pins which are very frequently used in die construction, and which are supposed by some tool makers to be indispensable for the perfect working of a die of this or other descriptions. There are many feed mechanisms for power presses, and the one most commonly used in connection with the single-acting press for cutting out washers is the simplest form, which is known as the finger-motion feed. It is a simple mechanical attachment whereby the strip of metal from which the washers are being cut may be quickly moved by hand the required amount. This feed or stop, which is used instead of the guide or pilot pins for obtaining accurate work, consists of an adjustable finger mounted on a small rock-shaft at the back of the tools and between the uprights. This shaft is so actuated, sometimes by a cam, but generally from the motion of the

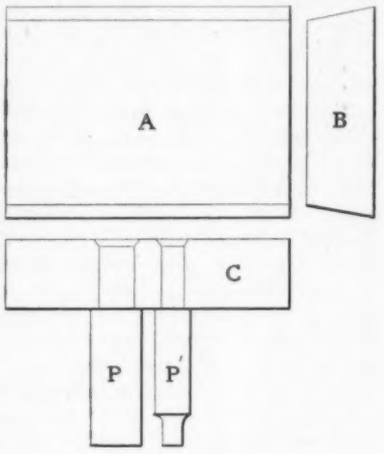


Fig. 1

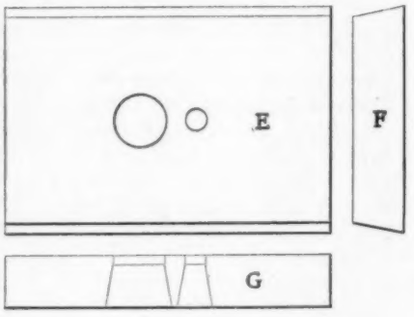


Fig. 2

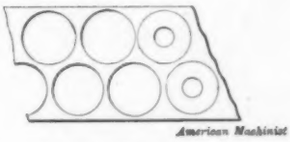


Fig. 3

GANG WASHER PUNCH AND DIE.

gate, that the finger lifts away from the face of the die while the metal or stock is being moved, and then drops, in time to stop against the edge of the hole last cut. Such a device attached to either a single or double-acting press renders valuable service. In the case of a gang press, which is capable of producing several blanks or cups at each stroke of the press, we use a substantial, multiple-pawl, roll feed. The cams and rolls of this feed should be of the best tool steel, hardened and ground.

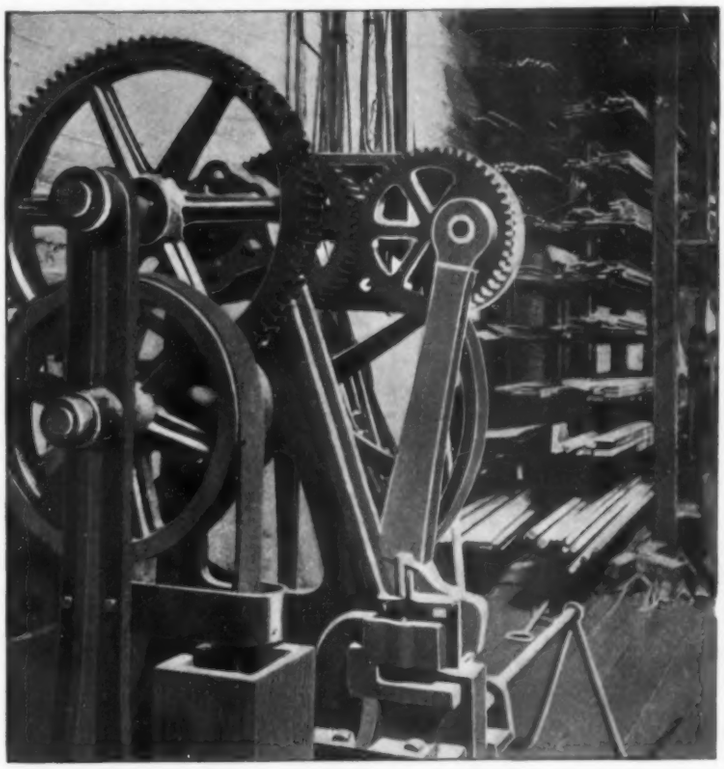
Economical Small Steam Engines.

BY W. H. BOOTH.

It is by no means always the economical motor which is commercially the best or most economcial. In country places, for example, it is often necessary or convenient to have a small motive power. Small and economical steam engines may be made, but are costly. The boiler must be of high-pressure type, and a constant attendant is necessary. Where about half a horse-power is required a constant attendant soon raises the total cost of the most economical engine to a ridiculously heavy rate per horse-power. Though gas and oil engines have recently tended to push it out of the way, it is doubtful if there is any motor so economical under these circumstances as that wasteful form of steam engine, the Newcomen, or atmospheric engine. This was the steam engine as Watt found it, and it was resuscitated in the Davy safety motor. Where there is an available source of water for condensing, this engine is most convenient. The boiler has a safety valve, it is true; but it is unloaded and represents at most an inch or two of water pressure. Connected with the boiler is a small tank with a ball feed valve, and as the water level falls it is simply made up from the side tank by the natural tendency of the water to find its own level. The fuel is coke, and it is automatically supplied from a hopper which holds enough for a six hours' run. Now, such an engine may be wasteful of fuel; but even if its fuel consumption is 10 pounds per horse-power hour, a day's run, consuming, say, 100 pounds, will only cost about 15 cents, at an ordinary price for coke, for one horse-power. Now, one horse-power, allowing even 50 per cent. for mechanical losses, will raise over 500 gallons of water per hour from a bore-hole 200 feet to the house tank. At 5,000 gallons per day for 15 cents, the cost of pumping comes out at 3 cents per thousand gallons, whereas water supplied by a main, if there be one, costs 12 to 16 cents per thousand gallons. A supply of 5,000 gallons daily will keep going an institution or school of 200 inmates.

In the safety motor we see one of the most obvious economies of wastefulness. Perhaps I ought to say that it points to the economy to be obtained from labor-saving machinery, when so wasteful a machine will save so much. This motor works simply on vacuum. The boiler supplies steam at 212 degrees and at atmospheric pressure or even less; for when once going the engine actually draws the steam into its cylinder, and it exhausts through the surface condenser. The speed is moderate, and lubrication can be effectively performed by such means as needle lubricators on the shaft. A gardener or a boy can fill the six-hours hopper in a few minutes and start the motor by a turn of the wheel to pump out non-condensable air and draw vapor as far as the condenser. Then the motor will run until the fire has burned out and the water in the boiler ceases to give off vapor. There is no danger. The one disadvantage is the large bulk for small power and the comparative costliness per horse-power; but where it can be afforded there is no equal for small powers; and where there is a greenhouse to be kept warm, the condensing water may be so employed and used round and round. In that case it is obvious that the motive power will really cost very little. It will occur to the thrifty-minded that if they are careful to have thoroughly good air-tight joints to their house-warming pipes, and will spend a little longer time when starting up, they may carry the motor exhaust round the heating pipes before they enter the condenser, and thereby secure not only a higher heat on the pipes, but save much of the bulk of condensing water otherwise necessary. The condensing portion might resolve itself merely into an air pump, the heating pipes of the greenhouse being a sufficient condenser, especially if well supplied with water troughs, as usual in a "tropical" house.

These are really very simple matters, yet it is infinitely difficult to persuade the non-technical man of their truth. Thus a man wants water at 70 degrees, and he draws it from a river which is down to 40 degrees in winter and up to 65 degrees in summer. His yearly average is 52½ degrees, and he must warm it more in winter when fuel is dear. He could obtain his water at 51 degrees all the year round from a well, and the steam he would require to pump it would all be absorbed in a surface condenser and, at most, heat the supply to about 60 degrees, still leaving more direct heat to be added. Yet that man cannot see that it costs him nothing in fuel to pump that water, excepting the mere trifle of heat converted into energy of position, the water having been raised perhaps 100 feet against gravity. It is far safer for a man to be his own lawyer or his own doctor than for him to believe, as so many men do believe, that they understand engineering. Men generally are more ignorant of engineering, chemistry and physics than they are of law or medicine, and one can best realize this by the remarks commonly heard on electricity. A man looks at an electric car, and often may be heard to explain how very soon there will be no steam engines. He has not, when he says this, any idea of "tapping the ether" for our future energy, but he is simply ignorant; and it is just such men as this who drop like over-ripe pears into the hands of such men as the late Keely or anyone who will tell them that engineers have been all on the wrong tack and their own invention will revolutionize everything.



SHEARS WITH NOVEL MOVEMENT.

A Power Shear With a Peculiar Movement.

An important time and labor saver in connection with the blacksmith shop, wherever power is available, is a power shear for cutting up the smaller sizes of merchant iron and mild steel. No ma-

chine shop of any size can well afford to be without such a tool, yet it is still lacking in many shops. The half-tone is from a snap-shot photograph of a handy power shear in use in the blacksmith shop of The Arthur Company, 188 Front street, New York, by whom the shear was built. The very neat blacksmith shop is in the top story of the building occupied by the firm, and the machine is driven, as will be noticed, by a belt coming up through the floor.

The details of the machine are neatly and compactly arranged. A small pinion on the pulley shaft, which also carries a heavy fly-wheel, engages with a large gear on the main shaft, these two shafts being all that are employed, and there is nothing calling for special mention about the machine except the peculiar, if not absolutely novel, device employed for connecting and giving motion to the shear lever. The shear shown has cut mild bar steel ¾x3 inches and 1-inch round steel with the straight cutter. An adjustable guard is provided behind the bar to prevent its tipping up under the shear, and a gage also for cutting off to any required length.

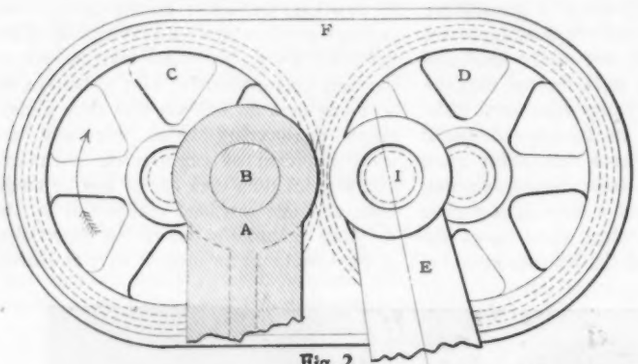


Fig. 2

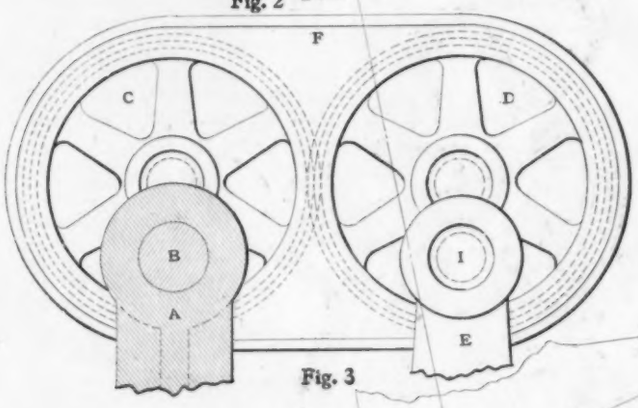


Fig. 3

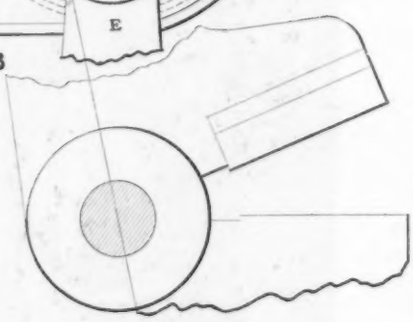


Fig. 2

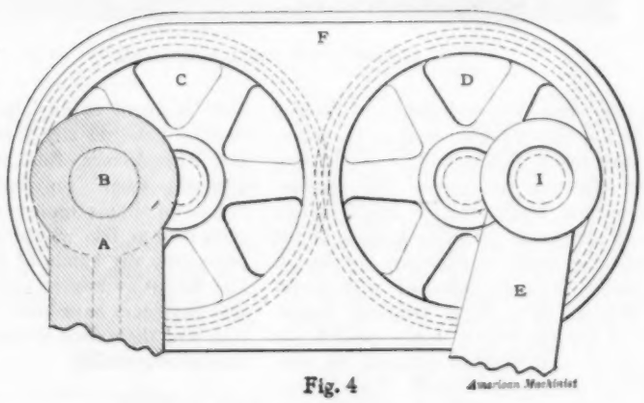


Fig. 4

MOVEMENT OF THE GEAR CONNECTING ROD.

The peculiar movement referred to may be understood by reference to the sketch, Figs. 2, 3 and 4, not intended to be minutely correct to scale or detail, but sufficient to show the principle. *A* may represent the main standard of the machine and *B* the main shaft. On the outer end of this shaft is eccentrically mounted and securely keyed the spur gear *C*. This gear and also gear *D* are round and ordinary spur gears, except that the teeth are rounded at top and bottom, this shape being preferable because the thrust of the shearing lever has to be borne by them. Gear *D* is eccentrically mounted on the pin in the eye of lever *E*, turning freely upon it. Outside of the two gears is a frame *F* of a shape corresponding to the periphery of the two gears, and drawn in the sketch with a lip or shroud which covers and protects the teeth. This frame *F* is stiffly ribbed and has two hubs or bosses with pins upon which the two gears are mounted by their central hubs, so that they turn freely and are constantly in correct mesh with each other.

Starting from the position in Fig. 2, and turning the main shaft in the direction of the arrow, gear *C* of course being carried around with the shaft, a rotation of 90 degrees brings the parts into the position of Fig. 3. As gear *C* has made a quarter of a turn, *D* has also turned the same, and, as a consequence, the eccentric hubs of the two gears, which in Fig. 2 were at their nearest approach to each other, are now double as far apart as before, and as these hubs have separated, the pin *I* of the lever *E* has been correspondingly carried away from shaft *B*. On turning the shaft another quarter of a turn, or to the position of Fig. 4, the lever E is driven still further, or to the limit of its cutting movement. The pin *I* is now three times as far from *D* as in Fig. 2. A further half turn of the main shaft in the same direction brings all the parts again to the position of Fig. 2. It will thus be seen that the entire function of the usual crank and connecting rod is taken by the two gears. The movement of the two hubs, alternately toward each other and then apart, forms in fact a continually shortening and elongating connecting rod, this alternate change of length or distance giving the required movement to the shearing lever. Frame *F* is always level except for the slight up and down movement at the right hand end, due to the oscillation of lever *E*. The machine works smoothly and effectively, and the peculiar movement of the gears is strikingly unusual.

Machine Tools—XI.

BY JOHN RICHARDS.

PLANING MACHINES.

A remarkable fact in connection with the development of machine tools is the comparatively late period at which planing machines came into use. The analogy to planing wood should have sooner suggested the metal planing machine; indeed did do so to the extent of producing hand planes for straightening the narrow ways of engine lathes and like work, but the true machine dates from 1814, or thereabout, when three men, Mr. James Fox, of Derby; Matthew Murray, of Leeds, and Richard Roberts, of Manchester, England, all made planing machines that embodied their essential features. That of Roberts, probably the first, can be seen in the Kensington Museum, in London, where it was removed after long service, and is by no means a bad machine.

The cost of preparing flat surfaces by hand, a thing now so rare as to be unknown to mechanics, at the time of introducing planing machines, was about $3 per square foot at the low rate of wages then paid. So an incentive for producing and improving planing machines was not wanting, but the wonderful gain effected by the first machine was such that it seemed to blunt improvement or refinement of the machines, which continued to be made very much like the original models for more than forty years, or down to the time when American inventors took up the subject and added various excellent improvements, some of which have not even yet found their way into European practice.

These improvements consisted (1) in the introduction of the large intermediate wheel to gear into the rack under the table; (2) operating the feed-motion from the driving gearing instead of from tappets on the table ; (3) the employment of two driving belts instead of one; (4) differential shifting devices for the driving belts; (5) setting the driving shaft of the machine parallel to the table movement; (6) narrow driving belts moving at high speed instead of wide ones at slow speed. These are the principal features, but it must not be inferred that these improvements spread rapidly in this country. It required thirty years or more before the double belts, differential shifting gearing and feeding from the driving gearing came into general use.

It is true that these things were more or less the subject of patents and were mainly inventions of William Sellers & Co., but aside from this was that hindrance so often spoken of here, the want of analysis and logical investigation by machine-tool makers.

In 1878 when the writer had set up a Sellers & Co. planing machine at Manchester, England, he invited one of the foremost tool makers of the city to come and examine it. The various motions were shown, such as the table being reversed by the hand lever with little or no effort, the high-speed belts, differential shifting gearing and other things. Finally this man observed a bent rod that communicated motion from the table tappets to the shifting gearing and said, "We would not dare to make a thing like that. It has no strength." He had inferred that this little rod operated the feed motions, as on his own machines, and had never seen the two functions separated, although Sharps, Stewart & Co., his neighbors, had for years been making Sellers planing machines with the same parts and movements as the one under examination.

Some further discussion of these American improvements in planing machines will not be out of place here, because there are those among the younger mechanics who have not seen or operated the older type of planing machines, and no doubt a good many who know the older machines have failed to investigate and understand the improvements that have succeeded.

First—In respect to the table tappet motion. In the old machines the tappets had not only to shift the belts, but to operate the feed motion at the same time, which called for a considerable force—five or ten times the present duty of the tappets—and because of the rapid motion of the feed gearing produced a shock and rattle that suggested destruction of the parts. If the table was to be reversed, this was nearly impossible to perform by hand, because in shifting the belts the feed gearing had to be moved at the same time. If the table was to be stopped the only means was to stop the counter-shaft.

With the new feed-operating devices actuated from the driving gearing this motion is independent from the shifting devices, starts easily without shock and acts gently, while the table is making its back stroke. There is no noise or shock and no sliding of tappets to spoil or wreck a machine.

The two belts of narrow width running at high speed was perhaps the most marked among the improvements, not only in permitting easy change and control of the speed for the forward and back motions of the table by altering the size of pulleys, but also in dispensing with a train of noisy and perishable driving gearing. It also shortens the shifting range of the belts to one instead of three widths, laterally, and does not permit them to interfere and screech by both being in contact with the middle pulley at the same time. This was a very great improvement.

To shift a belt from one pulley to another requires that it be deflected edgewise so as to wind in a spiral path across the faces of the pulleys; hence, the ease with which a belt can be shifted is inversely as its width and directly as the time and velocity of movement. These are facts of widé application in machine-tool practice that have but little recognition except in the case of planing machines. There will be occasion to allude to the matter again in connection with other reversing gearing.

The intermediate rack-wheel or "bull-wheel" prevents the lifting action that was a source of difficulty with the small pinions formerly used in this country and yet seen on most European machines. This improvement permitted the tables to be made much lighter in weight and prevented what is called "digging in" when planing fibrous iron or steel; also enables the main cross shaft to be set low enough so the last or main driving wheel of the driving gearing would not project above the top of the table. The origin of this method of gearing is not known to me.

The differential shifting gearing for the belts that prevents the screeching and waste of power is so obviously a common-sense expedient that the only comment that can be made is to wonder at its late introduction. It came in with the double belts, and was of course a sequence of that method of driving.

Narrow high-speed belts with narrow pulleys of large diameter, with their axis in line with the machine, so planing machines could be set parallel to lathes, the line shafts and the course of moving material in a shop is another common-sense expedient.

The Sellers screw pinion was an unique improvement, and also was a new mechanical movement not very well understood even at this time, thirty years or more after its introduction. It is not meant that the nature and operation of this gearing has not been analyzed and explained scientifically, but there is not one in a hundred who has a correct conception of its action.

The teeth in the rack are set at an angle of 85 degrees from the line of movement, to compensate for the lateral thrust caused by friction of the teeth. This is an ingenious expedient, and one of some importance in operating. The thread or teeth on the pinion (both these names apply) have in part a sliding action like a screw and in part the action of a tooth wheel, the two being about equally divided.

The screw action is, however, different from a common worm or screw, in that the contact is a sliding one from one side of the rack to the other, causing equal wear across the faces, and giving an endurance that is remarkable.

This gearing has never found its way into other uses, most likely because of the oblique position of the shaft and the special character of the driving wheels that this position requires, also in various requirements in construction not provided by common machine tools. The inventor

did not require a patent to protect him in the manufacture.

Planing machines, as commonly made, are the most illogical in design of all machine tools, and it is possible that the future will bring about a change in features that have become to some extent a subject of investigation. The idea of loading massive work on a massive table and dragging both backward and forward beneath a cutting tool double the distance that the tool acts, seems anomalous, and is so. It is like dispensing with the carriage movement of a lathe and sliding the heads on the bed for the feed movement. This impression came to mind with special force many years ago when I visited the works of Sir John Brown & Co., at Sheffield, England, where there were a number of large machines at work cutting off the edges of armor plates from 12 to 18 inches thick, weighing as much as 25 tons resting on platens that were as heavy; all together equal to 50 tons moved backward and forward at a slow rate, double the length of the cut; all to receive the action of a parting tool 5/8 inch wide. This was an extreme case, and was bad practice, no doubt, because a stiff circular saw with detachable teeth and supported above and below the plate would have done five to ten times as much work, and done it better, at a cost of one-third as much for the machine.

Some faults of common planing machines are as follows: The room required for moving twice the range of the cut; the ponderous moving parts and their load; the machine becoming weaker as the dimensions of the work increase; excessive weight and first cost, which are mainly directed to sustaining and moving the work, instead of cutting it; the limit of depth or hight between the tools and the platen or table.

Most of these conditions apply to shaping machines, where compensation or tool support falls off as the dimensions of the work and the stroke increase. In fact, the difficulties of the operation seem to be inherent in the process. There has been in England, and elsewhere in Europe, during late years an effort to avoid the running-table system, especially for heavy planing, and not many large machines of the running-table kind have been made for twenty years past. In fact, moving table machines cannot be employed for much of the ponderous marine and other work met with in modern engineering works. Planing is done by various special means too diversified for description here, with a tendency, however, toward portable apparatus.

In this country machine tool makers have adhered to the moving tables in a degree that is questionable practice, making machines of immense weight and proportions that must necessarily be idle most of the time or employed on light work far within the machine's capacity, causing a loss by reason of a large amount of capital invested in the machines and their slow performance.

There is also an impediment to tool supports in common planing machines. The overhang beyond the cross rail, and its torsion, produces a weakness not always suspected, provided for in some degree by the modern methods of making cross rails of a box section and with a broad bearing on the faces of the uprights; still, the rigidity is much less than is desirable—a fact easily proved by attaching a staff of wood 6 to 8 feet long to the tool saddle, to indicate flexure when heavy cutting is being done.

In the Elswick Works (Sir William Armstrong & Co.), New Castle, England; in the Government Arsenal in St. Petersburg, Russia, and in the Government Works at Terni, in Italy, there are employed for heavy cutting on steel, machines as shown in Fig. 84.

These machines, commonly supposed to be weak because of the overhung tool support, are in fact much more rigid than table machines. This is a problem of compensation not difficult to compute. The small machine shown in Fig. 85, called a 20-inch size, will cut key-ways in fibrous iron or steel 3/4 inch wide without chatter. A short time ago I received from the Naval Gun Factory at Washington chips cut from steel by one of these small machines representing a section 5/8 inch wide and 1-16 inch in thickness.

The impediments to what may be called

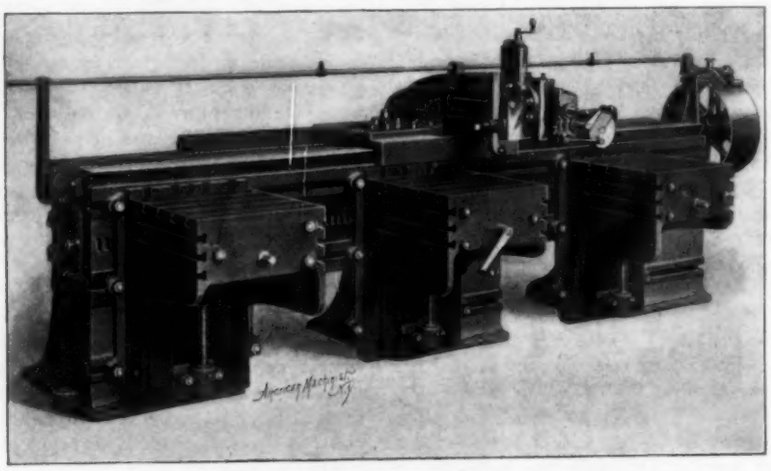


FIG. 84. HEAVY RICHARDS SIDE PLANER.

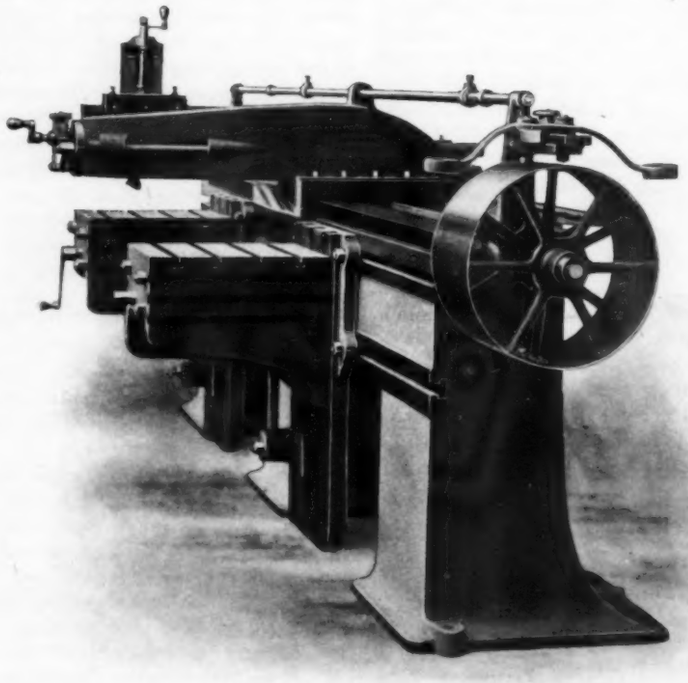


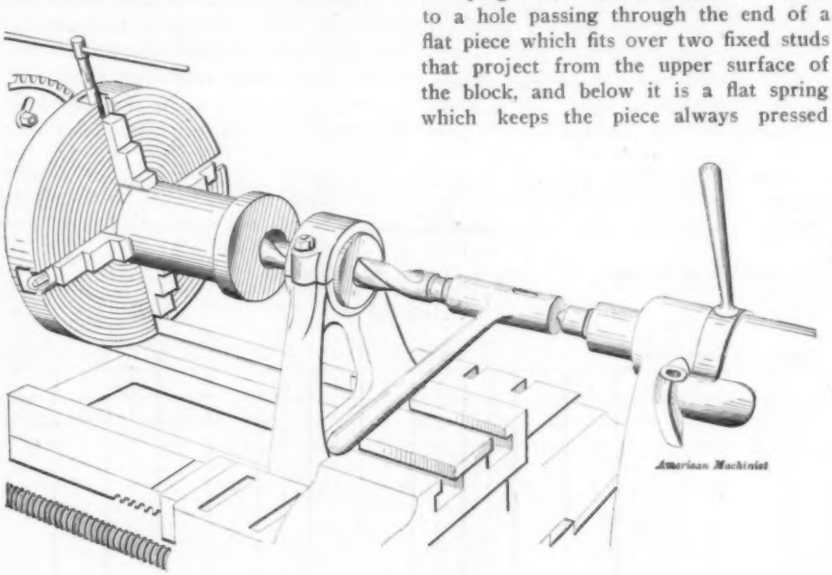
FIG. 85. SMALL RICHARDS SIDE PLANER.

a logical design for planing machines are in a sense insuperable, because of the widely varying distance between the "terminals," or the supports for tools and material, that has to be provided for in machines for general purposes. If this distance could be confined to a certain work, or to pieces of a certain size, compensation would be easy for the heaviest strains. As it is at this time and in respect to practice in all countries, it may be said that the trend is toward moving the tools instead of the pieces to be planed, whenever the work is heavier than the tools and their supporting members.

The table machines are as nearly perfect as can be hoped for, and are perhaps more advanced than any other class of machine tools; certainly they have attained more nearly a standard type than lathes, drilling, milling and other machines, especially in American practice.

Twist Drill Socket for the Lathe.

It is very convenient to be able to use a twist drill efficiently in the lathe, since of course the drill used in that way has all the advantages it possesses when used in a drill press; but it is not good practice to use such drills of any considerable size depending upon the tailstock spindle to resist the twisting force. To overcome this difficulty, and to make it convenient to use drills efficiently, Mr. John Walker, of 635 Jackson Boulevard, Chicago, is making a socket, shown in our illustration, which has a standard taper hole with slot, and at the rear is centered, being provided with a handle which rests upon any convenient portion of the lathe to prevent the drill from turning. This enables drills to be used in a rest such as is shown, or of course they may be used without the rest where the work is previously centered or a hole is started by boring.



SOCKET FOR USING TWIST DRILLS IN THE LATHE.

Size of Base to Resist Wind Pressure.

Prof. Archibald Barr, in a paper read before the Institution of Engineers and Shipbuilders last March, said: *"Similar* obelisks can withstand the *same* wind pressure if they stand on bases of the *same* size. Cleopatra's Needle has a hight of 67 feet, and weighs about 200 tons. Near the base the breadth on the wider faces is about 8 feet, but it is reduced at the base to about 5 feet in diameter, as shown in the middle diagram. If no crushing took place, a pressure of wind of about 85 pounds per square foot would be required to overturn it. Now, an obelisk of twice the linear dimensions of the needle, and one of half the dimensions, would require the *same* breadth of base to make them alike suitable to bear the same wind pressure.

Adjustable Surface Gage.

We illustrate an adjustable scribing block, surface and depth gage. The needle passes transversely through the usual clamping bolt, which in this case is fitted to a hole passing through the end of a flat piece which fits over two fixed studs that project from the upper surface of the block, and below it is a flat spring which keeps the piece always pressed snugly upwards against a knurled nut, so that there can be no lost motion.

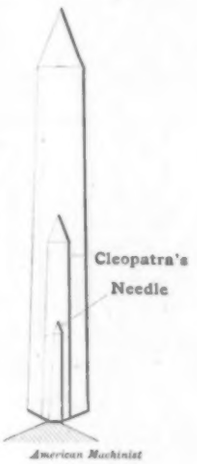
A hole is drilled through the base in such position that the needle may pass through it, and the tool thus becomes an adjustable depth gage. The base of the gage is 2¾ inches long, 1⅛ inches wide, with finished working surfaces and edges, japanned center, and is made by J. Wyke & Co., East Boston, Mass.

A 25-pound bicycle will carry a man anywhere. A modern railway passenger coach weighs 1,167 pounds per passenger when its seats are all occupied. A Pullman car weighs 2 tons per passenger, or 160 times as much as a bicycle.

The Administration of the Premium Plan—I.

BY F. A. HALSEY.

Since the publication of the article on "Experience with the Premium Plan of Paying for Labor," in the issue of March 9 last, a great number of inquiries for further information have been received at this office. The majority of these have related to the methods of conducting the plan in the shop—to the manner of presenting the premium offer to the workmen, to the keeping of the records, and the incorporation of the premiums into the wages and cost accounts. Several have asked how the plan is worked in combination with the days-work plan under conditions which make the use of the premium plan throughout the works impossible.



These inquiries have led to the preparation of the present article, the purpose of which is to show just how the plan is carried out in some of the shops where it is used. No attempt is made to offer a perfect method, the object being simply to show how the work is actually done.

ADJUSTABLE SURFACE GAGE.

Inasmuch as these methods were devised independently by different men, they are far more suggestive than any mere scheme or proposed method could be.

The blank forms and records provided

for the premium plan must accomplish three objects:

(1) Record the time spent on each premium job.

(2) Credit the premiums earned to the workmen earning them.

(3) Charge the premiums to the jobs on which they are earned.

DAY TIME TICKET, THE CANADIAN RAND DRILL CO.

DATE (DAY AND MONTH.) WORKMAN

.... HOURS ....

Job Number or Name.	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	1	1½	2	2½	3	3½	4	4½	5	5½	6	Over-time
a b c																								
d e f																								
g h i																								

THIS TICKET TO BE PLACED IN THE BOX BEFORE LEAVING AT NIGHT.

FIG. 1. ACTUAL SIZE 4 x 7¼ INCHES.

METHODS OF THE CANADIAN RAND DRILL COMPANY.

The methods used in these works were devised when the works were small and simplicity of bookkeeping was imperative. It was considered quite likely that changes would be necessary with the growth of the works; but, as a matter of fact, this has not been found to be the case. The methods as shown represent some changes from those tried at the start; but such changes as have been made were due to fundamental defects in the methods used at the start, and not to the growth of the business. The blank forms here shown have now been in use for about seven years, and have fulfilled their functions with entire satisfaction.

The record of the presence and punctuality of the men in the shop from which the daily-wages pay roll is made up is kept in the old-fashioned way—in a time-book ruled in columns for the hours of work each day. There is, however, no reason why a modern time-recording clock should not be used for this purpose, or, indeed, any other system which may be preferred. The essential fact to be noted is that primarily the record of the workmen's time is kept precisely as with the days-work system of pay. Whatever plan may be used for this purpose, the introduction of the premium plan need not involve a change. With the pay roll, however, provision must be made for crediting the premiums to the workmen. This might be done in a separate book; but at Sherbrooke the permanent pay roll was provided with extra columns for this purpose, as described later on.

The keeping of the time spent on each job is done by the aid of the Day Time Ticket shown in Fig. 1. One of these tickets is made out at night by every workman in the shop, regardless of whether he is working on premium work or not. The ticket forms the basis of the direct time charges to the different pieces of work in progress, these charges being made to premium and non-premium jobs alike, precisely as though the premium plan did not exist; and here again it may be said that any other good plan of taking the time may be used, and that the introduction of the premium system need cause no change in existing methods. In passing, it may be remarked, however, that this form of ticket possesses certain marked advantages. The four lines provide for four different jobs per day. The workman records his time on any job by simply making a pencil mark from the line showing the hour of commencing to the hour of finishing. He has no figuring of the hours to do, and need make no mistakes. Again, a mere inspection of the ticket shows instantly if the entire time for the day is accounted for, as will be apparent from the illustration.

Whenever a premium job is given out, a Job Time Ticket, shown in Fig. 2, is given out with it—the ticket being of a different color from the Day Time Ticket to avoid their getting mixed. The general form of the two tickets will be seen to be much alike; but while the day ticket is filled out at night and records the work of the day, the job ticket stays with the job until it is finished—the ticket providing for six days' work. This ticket when turned in, shows the actual amount of time spent on the job for which it was issued. If desired, the hour of commencing and finishing may be recorded by a ticket punch in the hands of the foreman. On the back of the job ticket is printed the following:

"The base time for this job is ..... hours. If completed in less time, a premium of .... cents will be paid for each hour saved."

The comparison of the front and back of the ticket shows the time saved, and the premium earned is quickly calculated, and entered opposite the workman's name in a premium memorandum book, and at the same time is charged against the job on the Job Time Sheet, shown later.

The permanent pay roll, already referred to, is made up by the bookkeeper at the end of each fortnight. Its form is similar to that in common use, with the addition of two columns at the right, as seen in Fig. 3. Following the wide column for the workmen's names are the usual columns for the records of attendance at the shop, the total attendance for the fortnight, the daily-wages rate, and the amount due for the fortnight at the daily-wages rate. Next comes the special column for the premium earnings for the fortnight, the amounts here entered being the totals to the credit of each workman for

JOB TIME TICKET, THE CANADIAN RAND DRILL CO.

Job Number or Name WORKMAN

.... HOURS ....

Date (day and month)	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	1	1½	2	2½	3	3½	4	4½	5	5½	6	Over-time

FIG. 2. ACTUAL SIZE 4 x 7½ INCHES.

the fortnight as recorded in the premium memorandum book already mentioned. The last column at the right shows the totals of the daily wages and the premium earnings, or the amount due the workmen. It will be seen at this point that no confusion in the wages accounting can result from day's pay work and premium work being done side by side. If any workman has earned no premiums during the fortnight, the premium column opposite his name is left blank; or if a workman has been engaged on premium work for a portion of the time only, such premiums as he has earned will appear in the premium column without reference to the non-premium jobs.

This method of time-keeping may be criticised as not up to date, as it certainly is not; but, as already stated, the purpose of this article is rather to show how the work has been done than to suggest improvements. In reply to an obvious suggestion that the job tickets might be allowed to accumulate until the end of the fortnight, and their totals be then posted direct to the pay roll, and so save the labor of keeping the intermediate premium memorandum book, it may be said that in this case the division of the accounting between the office and shop was such as to make this memorandum book advisable.

This completes the accounting, so far as the workman is concerned. The cost records are kept on a Job Time Sheet, Fig. 4, of which each main line is normally devoted to one operation on a piece of work, the date and time from the day ticket being entered day by day. The job ticket naturally comes in with the last day ticket, and the premium earned is charged against the job in the column at the right at the same time that it is credited to the workman in the memorandum premium book. When the job is finished, the sheet contains the entire record of time, wages and premiums against it, and the total at the bottom shows the sum of the wages and premium cost.

It should be stated that the job sheet, Fig. 4, is extremely flexible. The rock drills are reduced to a strictly manufacturing basis, and for that part of the work a job sheet is given to each piece. Air compressors, however, cannot be reduced to such a basis—at any rate not in Canada—and when dealing with them a sheet is given to a pillow block, or a connecting rod entire; the keeping of detailed costs of every piece being, for this class of work, unnecessary. For some special job of which there is no probability that it will ever be repeated, a sheet may be given to an entire machine, the column for operation being filled by writing "make." This plan is always followed with jigs for the shop, and in fact for any piece of work of which the total cost only is wanted.

A little consideration will show that the supposed difficulty of running the days-work and the premium plans side by side is purely imaginary, and does not, in fact, exist. In this respect the premium plan is far superior to piece work. Very few shops are able to reduce all their work to piece rates, and few will be able to place all on premiums. With piece work two systems of accounting for both wages and costs are necessary, and the taking up or the dropping of a piece-rate job involves a shifting from one system to the other—this change usually occurring so as to divide the records for the day between the two systems. No such transfer is called for with the premium plan. The records are all kept primarily as though the premium plan did not exist. The records of the day tickets are posted to the job sheet day by day, and the pay roll is kept as usual. Whenever a premium job is given out, a job ticket goes with it, and when this is returned its record is credited to the workman and charged to the job. When premiums are not earned they are not charged, and that is all there is of it.

It will be seen, in fact, that a premium job may be interrupted by a rush job, if necessary, without introducing confusion. In such a case there will be a gap in the line drawn on the premium job ticket representing the time put on the rush job; but this introduces no confusion in the accounting.

FIG. 3. SECTION OF PAY ROLL.

JOB TIME SHEET. CANADIAN RAND DRILL CO.

NAME OF PART..... NO. OF PIECES.....

WORKMAN.	OPERATION.		TOTAL HOURS.	WAGES.	PREMIUMS.
		Date,			
		Hours,			
		Date,			
		Hours,			
		Date,			
		Hours,			

FIG. 4. ACTUAL SIZE 8 X 10 INCHES.

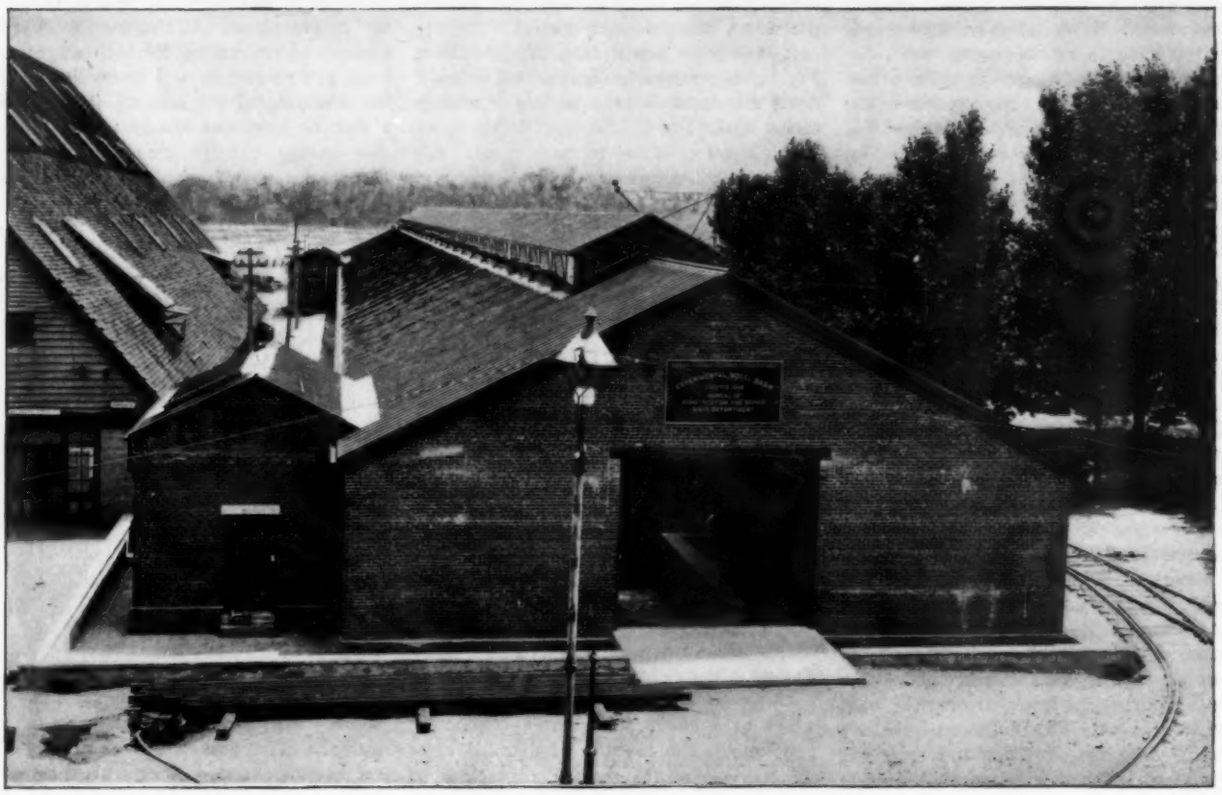


FIG. 1. EXTERIOR VIEW OF MODEL BASIN.

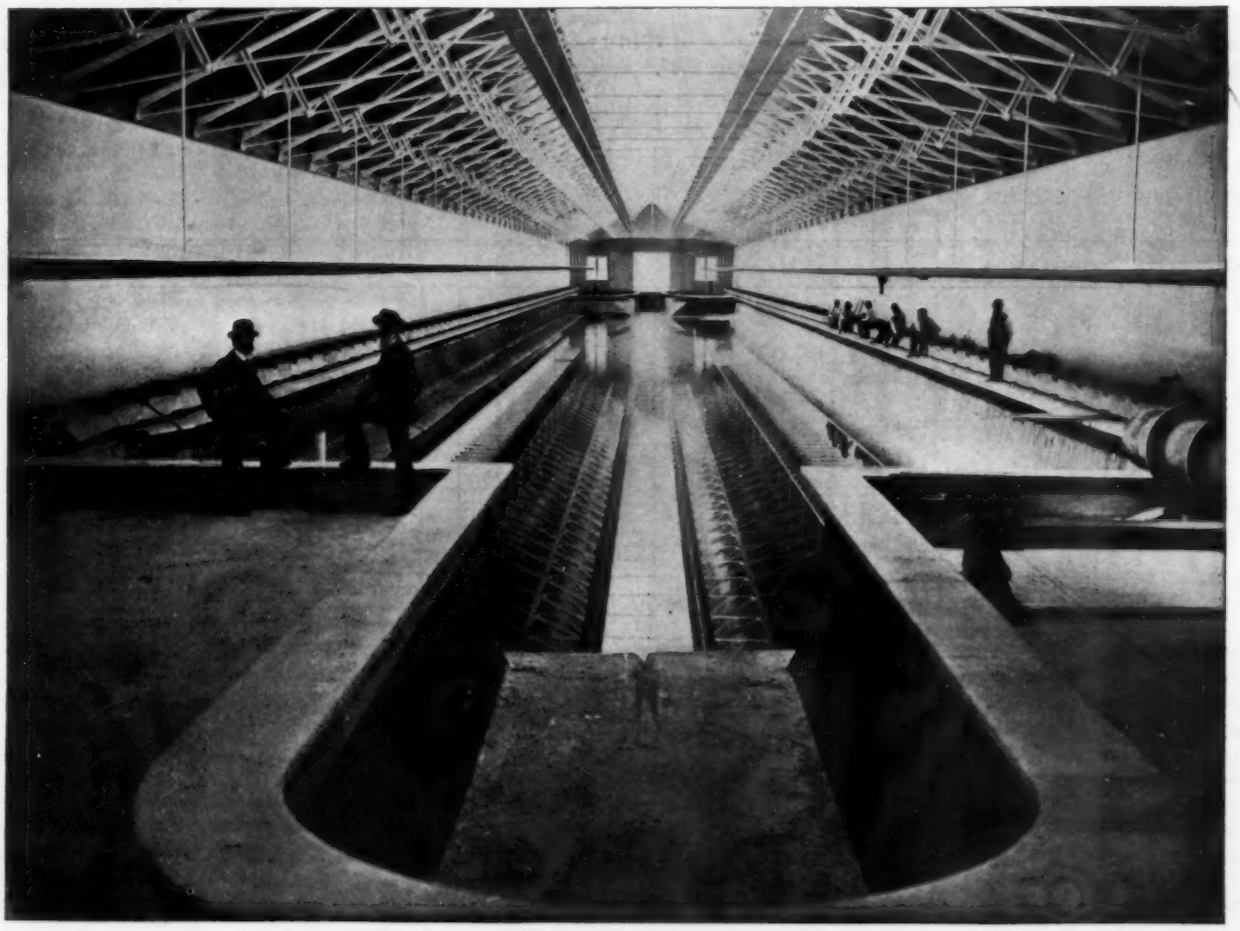


FIG. 2. INTERIOR VIEW OF MODEL BASIN.

For the Discouragement of Burglars.

The Pneumatic Safety Vault & Jail Company, of Chattanooga, Tenn., is proposing to make vaults secure against burglars without, and jails secure against prisoners within, by a system of construction which employs vertical steel tubes and hollow floors and ceilings, all kept constantly charged with compressed air. The pressure of air proposed to be carried is only 15 or 20 pounds, the escape of air at any point when a break is made in the system instantly causing a fall of pressure and the sounding of alarms at different points. Another burglar discouragement proposed to be used in connection with the air is a loose hardened-steel tube within the air tube. If any attempt at sawing a tube was made, as soon as it was penetrated the saw would encounter the hard, loose tube within, which would roll around under the saw and prevent all further cutting.

The U. S. Navy Experimental Model Basin.

Among the most interesting things seen by the members of the American Society of Mechanical Engineers at Washington was the experimental tank recently completed for testing models of vessels; and by the courtesy of Philip Hichborn, chief constructor and chief of the Bureau of Construction and Repair, we are enabled to present a number of photographs, a cross section of the structure, and the following description.

The value of towing experiments upon small-scale models of ships for the purpose of deducing the resistance of a full-sized ship from that of the small model, was demonstrated by the late Mr. William Froude, who at his own expense started a small tank for such experimental work at Torquay, England, about 1870. The English Admiralty subsequently recognized the value of his work and assisted him in it, later building a larger basin at Haslar, near Portsmouth, which is now in charge of Mr. R. E. Froude, son of Mr. William Froude. Other governments, notably Italy and Russia, were induced to establish model basins, which were largely copies of Froude's basin; and one firm of private builders, Denny Brothers, of Glasgow, Scotland, were sufficiently enterprising to build a basin for their own use.

The Construction Bureau of our Navy Department has appreciated for many years the value of an experimental basin, but it was for a long time unable to secure an appropriation for the purpose. Congress finally, about two years ago, granted $100,000 for this work, the grant being largely due to the efforts of the late Congressman Hilborn. The basin proper was completed the latter part of last year, and the special machinery and apparatus have now just been completed and installed, after a good deal of delay due indirectly to the war with Spain.

The basin is located in the southeast corner of the Washington Navy Yard. The accompanying half-tones, Figs. 1 and 2, give a very fair idea of the external and internal appearance, and Fig. 3 shows the construction of the main body of the tank proper. The building is 500 feet long and about 50 feet wide inside. The water surface of the basin is slightly shorter than the building, being about 470 feet long. The deep portion is about 370 feet long; the south end, from which runs begin, being shallow. The water surface is 43 feet wide, and the depth from top of coping to the bottom of the basin is 14 feet 8 inches. The basin is materially larger than any other in existence. The

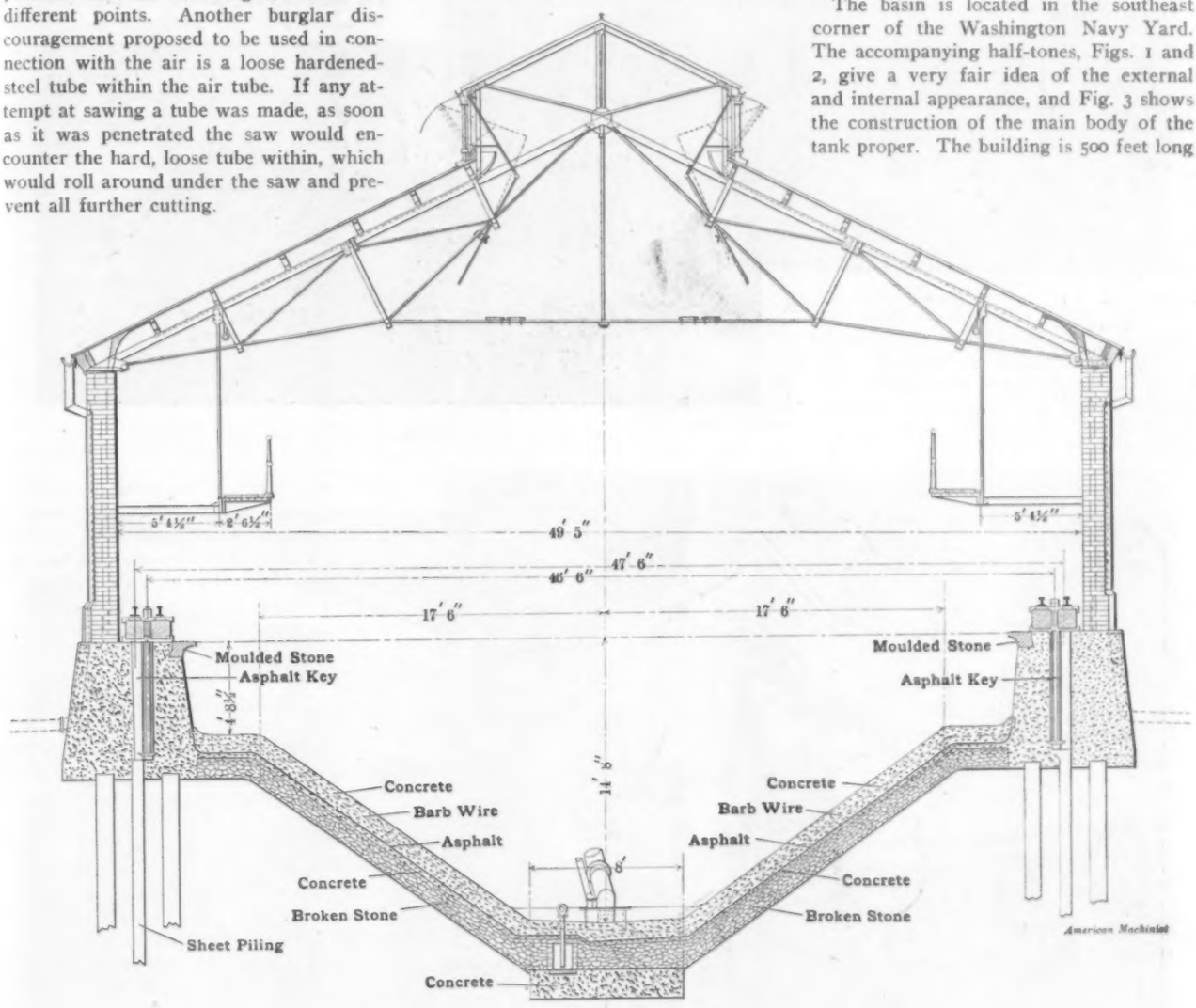


Fig. 3

CROSS-SECTION OF MODEL TANK.

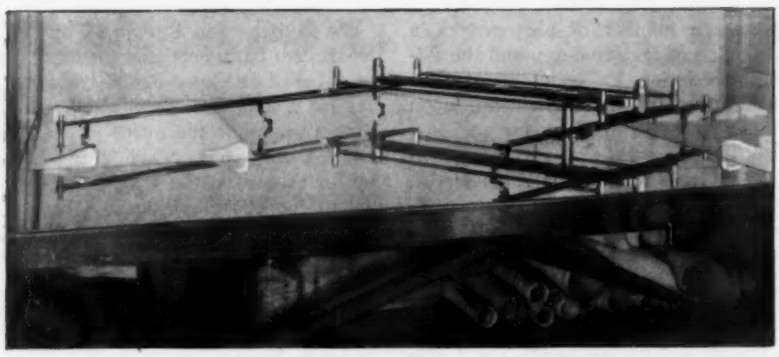


FIG. 4. PANTOGRAPH FOR REPRODUCING SECTIONS OF SHIPS

nature of the ground was such as to render the construction of a thoroughly tight and stable basin somewhat difficult; but owing to the small space available at the Washington Yard, it was necessary to locate it upon its present site. The bottom of the basin proper is made up of a layer of broken stone, upon which is a thin layer of concrete, then a half-inch of Neuchatel asphalt, then about 9 inches of concrete in 16-foot lengths; the keys between the various lengths being filled with Bermudez asphalt, and the whole inside surface covered with the asphalt. The heavy side walls are 6 feet thick at the bottom, 6 feet deep, and about 4 feet 6 inches thick on the top, not counting the molded stone coping. They are in 40-foot lengths, with a square key between adjacent lengths filled with Bermudez asphalt. The side walls rest upon a double row of piles, and in addition there is sheet piling completely around the deep part of the tank. The shallow part of the tank at the southern extension is also carried on piling, as it actually overhangs the water.

The law authorizing the construction of the model basin also authorized experiments to be made for private shipbuilders, provided they defrayed the actual cost of the same; it being understood, of course, that such experiments should not interfere

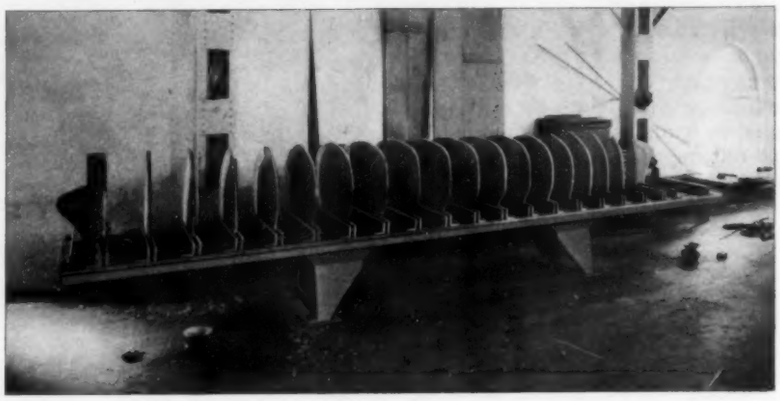


FIG. 5. SECTIONS OF FORMER MODEL ON ERECTING TABLE.

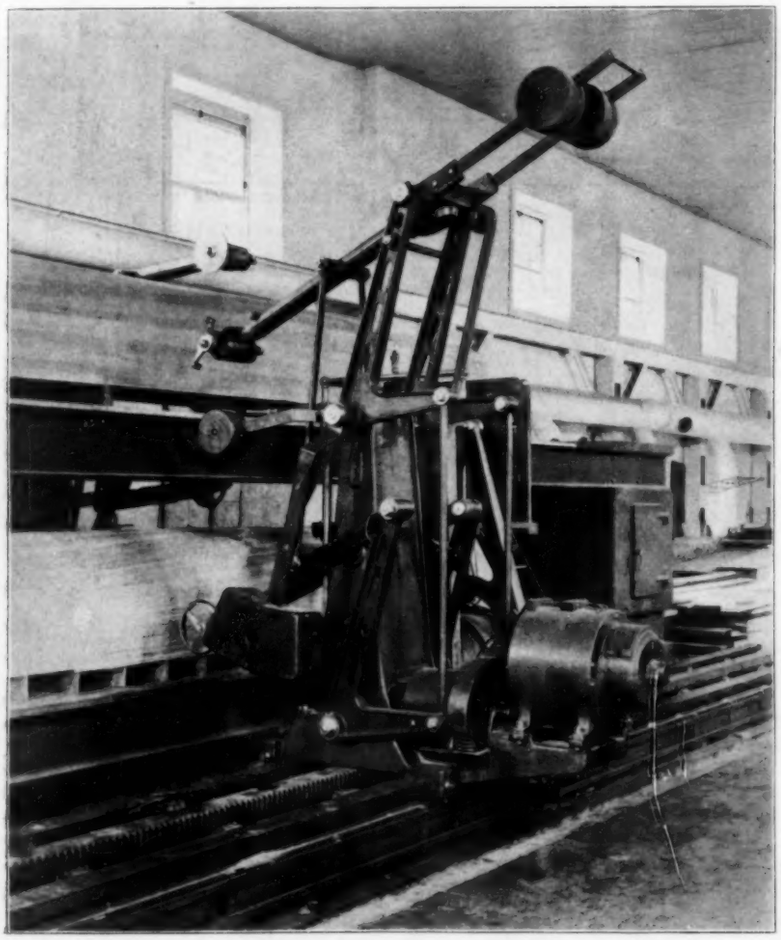


FIG. 6. MODEL-CUTTING MACHINE.

with naval work. This being the case, it was necessary to lay out the plant with a view to the rapid and economical turning out of routine experiments, and to this end the endeavor has been throughout to use machinery for as many of the operations as possible. The foreign tanks invariably use paraffine for the construction of models, and generally make them from 10 to 14 feet long. The climate of Washington is so warm in the summer that it was found impossible to obtain paraffine which would retain its rigidity satisfactorily, and, moreover, it was the desire of the Bureau of Construction and Repair to make the models as large as possible, thus eliminating one source of inaccuracy in applying the model experiments to full-sized ships. For these reasons wood was adopted as the material for the models, and after some difficulty a satisfactory varnish was found which rendered the surface of the wood to all intents and purposes water-tight. The standard length of model used is 20 feet. A model 20 feet long may not seem much larger than one 12 feet long, but when it is remembered that the displacements of these two are, respectively, as 8,000 and 1,728, it will be seen that the 20-foot model is nearly five times the size of the 12-foot model.

The method of building the models is as follows: The "lines" of the ship invariably include a body plan giving sections at moderately close intervals. From this body plan new sections are drawn to the proper size for a 20-foot model, by means of the eidograph or large pantograph

shown in Fig. 4. These sections are cut out of paper and then transferred to wooden boards, which are sawed to shape. These boards are then erected in their proper relative positions upon the erecting table shown in Fig. 5, each board section being clamped in a vertical plane. They are then covered with battens about ½ inch thick and tapering from midships towards the end, making a "former" model, the surface of which is planed smooth. In cutting out the sections allowance is made for the thickness of the battens which are to be nailed upon them. Meanwhile, a rough block of shapes and dimensions, to enable the finished model to be cut from it, has been prepared and glued together under pressure in a large hydraulic press. This block is placed upon the upper table of the model-cutting machine, illustrated in Fig. 6; the "former" model being placed upon the lower table, both as shown. The model-cutting machine works upon the principle of the Blanchard lathe, a roller traversing the surface of the "former" model, and saws or cutters working upon the surface of the model proper—the pantographic construction of the machine causing the saw or cutter, as the case may be, to reproduce the section of the "former" model. There are two of these machines, one each side of the model-carrying frame. In the picture the arm of the further machine, with a saw in position, is seen above the model, while the machine nearest the observer is fitted with a cutter. The machines are located in successive positions along the model, and parallel saw cuts are made over its entire length. The saws are then removed, cutters of the same diameter are substituted, and the surface is brought very close to the desired shape. The model is then removed from the cutting machine and finished by hand; a very small amount of hand work, however, being found necessary. It is then ready for varnishing, and the attachment of any appendages, such as bilge keels, struts, etc. It is finally taken to the measuring machine, shown in Fig. 7, and careful measurements made of its exact form and shape, which not only enable the staff to determine whether the model represents the lines desired, but give an exact record of the actual shape.

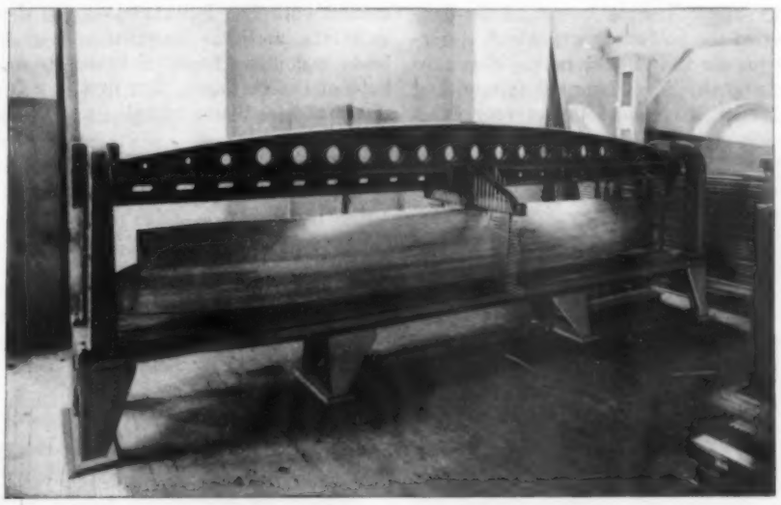


FIG. 7. MODEL-MEASURING MACHINE.

Fig. 8 shows the carriage or traveling bridge in place over the tank—the reflection from the surface of the water causing it and the roof lines to be reproduced below. The towing bracket will be seen below, and some of the manipulating and recording mechanism is in view. Fig. 9 gives a near view of the observers' seats, the recording cylinder, the switch-board, etc. The hand-wheels of Figs. 8 and 9 will identify the two views. The bridge runs upon eight wheels and spans the full width of the basin, as shown. The platform in the center carrying the recording apparatus can be raised or lowered at will. Electricity is used to drive the carriage,

FIG. 8. INTERIOR VIEW OF TANK WITH TRAVELING BRIDGE IN PLACE.

and it may be mentioned incidentally that it is used for all mechanical work in connection with the model tank. The speed of the carriage is varied not only by making various combinations of the four motors—one to each pair of driving wheels—but by controlling the output of the generator in the power station, which is perhaps 100 yards from the tank. This control is on the Ward-Leonard system, and in practice it is found that a very exact

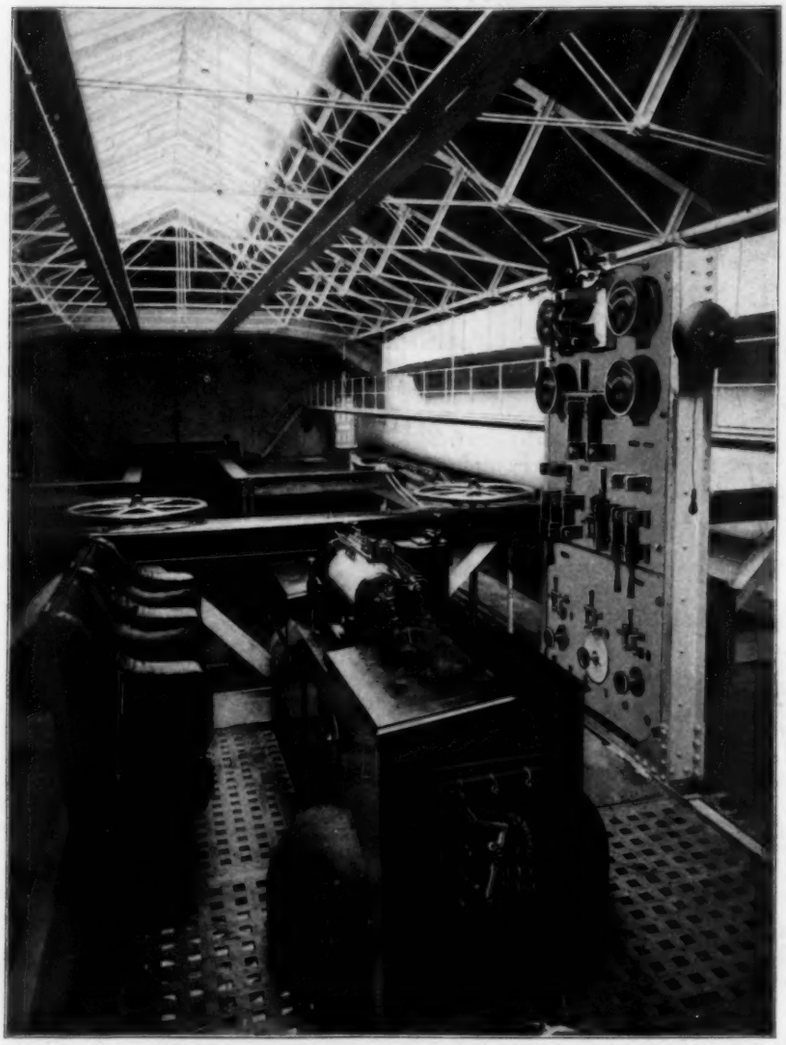


FIG. 9. OPERATING AND RECORDING MECHANISM OF TRAVELING BRIDGE.

regulation of speed is obtained by this combination. The carriage itself, with its fittings, weighs in the neighborhood of 25 tons, so that it alone forms a kind of flywheel and is not subject to sudden variations of speed. The speed of the carriage can be varied from 1-10 knot an hour, or 10 feet per minute, to 20 knots an hour, or 2,000 feet per minute. The principal difficulty in connection with the use of high speeds, which, while not necessary for the bulk of the experiments, will be of great value in certain special experiments, is to stop the carriage when it is once under way. The electrical control acts as a brake, because when the current is shut off the motors become generators, but this could not be relied upon for high speeds, since the sudden rush of current due to possible unskillful manipulation would throw the circuit breakers, thus opening the circuit and cutting off the current entirely. For these reasons there is at the north or terminal end of the basin a double system of brakes to take hold of the carriage. The first is a friction brake consisting of two strips of iron on either side, pressed together by hydraulic cylinders. These are forced apart by a slipper on the carriage about 10 feet long, which, as well as the brake strips, is kept thoroughly oiled, so that the coefficient of friction for stopping, though low, is fairly definite, and sudden jerks are avoided. The pressure in the hydraulic cylinders is controlled by an accumulator and a pump driven by electricity. Great care has been taken in connection with this part of the installation, that it may be always in working order, and any trouble or break-down, except that of the pump itself, which runs all the time, will simply result in setting the pressure at a maximum. This maximum is 600 pounds, but it has been found by actual experiment that with 500 pounds pressure the carriage is brought safely to rest when it enters the brakes at a speed of 20 knots. It is not expected in practice to repeat this often, since even for the high-speed runs the electrical brake will be used to reduce the speed of the carriage before the friction brake is used. In addition to the friction brake, there is what is called the emergency brake; so that in case the friction brake fails for any reason, the carriage will still be caught. This brake consists simply of a piston about 16 inches in diameter working in a cylinder which is submerged in the water of the tank, and connected by wire cables to a hook which takes hold of the carriage. The head of the cylinder has a round hole, and the piston rod is tapered so that as the rod is drawn out by the motion of the carriage, the hole is gradually closed, the whole being almost exactly upon the principle of the hydraulic gun recoil brake. An escape is provided for the water around the piston when it starts from rest, to avoid sudden accelerations from the whole mass of water in the cylinder.

The dynamometric apparatus is designed to avoid entirely the use of multiplying levers or other devices involving the possibility of friction, and here again electricity is enlisted. The recording drum is fitted with apparatus for recording the time and distance, as usual. The resistance is measured directly by a spring, the arrangement being as indicated in Fig. 10, which is a view underneath the carriage. The forward end of the spring is attached to a bracket which is screwed forward or back by an electric motor, and a rigid arm runs up from the bracket, carrying a pencil to record its position on the drum. The record then is of the position of the forward bracket. The after end of the spring takes hold of a small cross-head to the other end of which again is attached a towing rod which takes hold of the model. This cross-head has a very slight play between stops in the after fixed bracket, and when it touches either stop closes an electrical contact which again throws an electric clutch by means of which the motor running all the time, screws forward or back the forward bracket, thus increasing or decreasing the tension of the spring until the contact is opened again.

In this way the resistance pen has to move but a small distance to reach the position of equilibrium, and almost immediately becomes steady. It will be seen that with this device friction is eliminated. The accuracy obtainable depends upon the closeness with which the automatic stops at the after end of the spring can be set. In practice it is found that these can be set to give a play of about the fiftieth of an inch, and as the springs will extend 10 inches, the results obtained are practically

exact as indicating the pull of the spring.

In practice, when about to make a run, the operator works the bracket forward to the immediate vicinity of the position which he knows it will assume during the run, the approximate speed of which he knows. The carriage is then started, and after a uniform speed has been obtained (which, for speeds up to 12 knots, is done within 50 feet), he throws in by a single motion of one handle the automatic appliances which start the drum and record time, distance and resistance.

A weighing apparatus is provided at the starting end of the basin, by which the towing spring is calibrated by comparison with dead weights; the value of a given position of the pencil on the drum being determined positively, and regardless of the theory of springs or of temperature or other corrections. In connection with this, a set of fixed pens may be set to locate the exact points of such calibration readings as come near the anticipated readings during a given set of experiments.

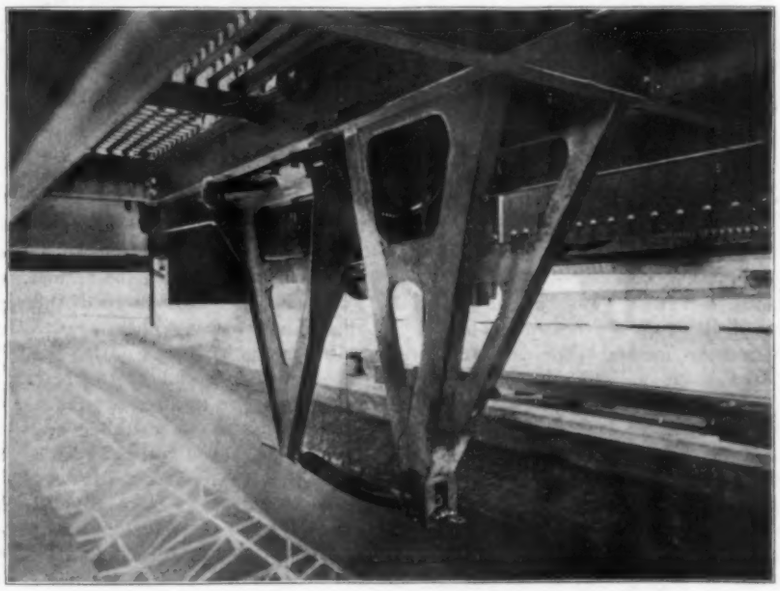


FIG. 10. DRAFT SPRING AND ATTACHMENTS UNDERNEATH BRIDGE.

The basin is filled from the water system of Washington, and will hold one million gallons.

The leakage from the basin, which is very slight, and the evaporation, are made up with filtered water, an animal bone filter being installed with a capacity of from 50 to 100 gallons per minute, depending upon the turbidity of the water. In practice a small stream of fresh filtered water is kept running into the basin all the time, and the level maintained whereever desired by an adjustable overflow.

The building and tank or basin proper were designed by the Bureau of Construction and Repair, as well as the machinery for making models. The electrical installation was fitted by the General Electric Company, many of the electrical details of design being also due to them. The carriage proper was built by William Sellers & Co.; the dynamometer apparatus partly by Sellers & Co. and partly by Saegmuller, of Washington, who also built the large eidograph. All of these are from the designs of the Bureau of Construction and Repair. The model-cutting machinery was built by Detrick & Harvey, of Baltimore, Md., to the designs of the Bureau of Construction and Repair. Naval Constructor Taylor has been in immediate charge of the work from its inception.

The model basin itself is now at work upon experiments to determine frictional coefficients of varnished surfaces and other constants needed in its use. Experiments are being made as opportunity serves upon models of the naval vessels already built and tried, for the purpose of accumulating data which will be constantly needed during the life of the tank. As soon as preliminary lines of the new third-class cruisers authorized at the last session of Congress are completed, experiments will be made with them in the tank with a view to introducing any refinements or improvements found desirable.

All the apparatus described has been tested and found to work satisfactorily.

Letters from Practical Men

Of What use are Eccentrics?—Electrically Moved Valves.

Editor American Machinist:

I will not be surprised to hear any day now the death-knell of the Corliss valve motion, of all the other "improved" valve motions, and even of the old eccentric and its connections to the slide-valve. Recent developments have rendered all those respected contrivances unnecessary. Humphrey Potter has the name of having started the moving of the valves of a steam engine by mechanical means, and James Watt and the others developed the idea, but they would all do these things differently today. Humphrey Potter especially, as a young man of the period, would know the uses and applications of the electro-magnet; he would be tinkering with electric bells and such things, and his head would be filled with electrical contrivances, so that the first thing that he would think of for automatically moving his valves, and getting off to a game of baseball, or for a run on a borrowed wheel, would be to use a battery and a wire and an electro-magnet, instead of pins and strings and bell-crank levers and such clumsy contrivances. Then we can imagine with what delight and with what success Watt could have followed such a lead as that, and how different would be the means employed for conducting the steam in and out of the cylinder, according to our notions of steam propriety. The engine which might have been and the engine which is would not know each other.

The engine which might have been may be the engine that will be, and may yet drive out the engine that is. I am talking now, it is to be remembered, only about the valve motion and the valves of the engine, and not about the possible transformations of other parts of it. We are throwing out our line shafts now at a rather rapid rate, taking the country through, and in many cases of new installations we are refusing to put them in, and we find that it is cheaper to get along without them. Running a little wire from the engine room to a machine a hundred feet or a thousand feet away is a very different thing from belting to a pulley on a long line shaft, with its several pieces, its couplings, and its hangers, and then perhaps belting to another line, and so on to the machine. So, there is quite a distance, and the road is not straight, from the crank shaft to the cylinder, and the eccentrics and eccentric straps and eccentric rods and wrist plate and valve rods and releasing gear and dash pots, besides the valves themselves, make quite a complicated mess of it, although quite admirable as long as we don't know any better; but the moment that we do their aspect changes. Why may we not have an effective electrical connection between these widely separated parts of the engine as well as between the engine itself and the machine which it drives a considerable distance away, getting rid of the costly and complicated parts, which cost also so much to drive? We save not only in cost of the parts and the cost of moving them, but we secure more excellent service. Electricity not only reaches far, but it is quicker than all else in action, and practically knows nothing of time. It should be pos-

sible with electrically controlled valves to produce better indicator diagrams than are now usually seen and the more correct steam movements which the diagrams would represent, for each movement of the valve could be more perfectly controlled than ever before. It is not becoming or proper for me to speak here in detail of how this is to be done, as others are now actually working upon this problem, and the knowledge of their undertaking is what started me off on the present occasion.

The ideal steam engine, I suppose, should have a valve for admission and another valve for the discharge at each end of the cylinder, or four valves for each steam cylinder, with the opening and closing of each independent of all the rest, each movement as quick as possible, each occurring at precisely the right time, and the time of cut-off, if not also that of some of the other movements, changeable according to the power required, the steam pressure or other conditions. To accomplish all this is not a simple task, but what can do it if electricity cannot? I suppose the regular rocking Corliss valve is not the best to use, but a transversely sliding gridiron valve, requiring only a short movement. The electrical part of the contrivance would only move a little piston which would act as a throttle for another piston capable of handling the valve, with cushion or other means of checking the rapid movement. The time for the action of each magnet would be determined by the position of the contact pieces around the shaft, and in the case of the cut-off these would be changeable by a movement around the shaft. In a recent patent a sickle-like contact plate is used, forming a curve receding from the center of the shaft, and then the sliding in or out of another contact piece changes the time of action.

These electrical devices are beginning to suggest themselves for employment in many places around machinery besides for operating the valves of steam engines. They are, or should be, especially useful about the large machine tools, and save the operator many steps in throwing in or out, or reversing or changing speeds or feeds. When the average mechanic begins to think electricity, which he does not yet, it will find more frequent employment than now.

TECUMSEH SWIFT.

A Jig for Planing a Clutch.

Editor American Machinist:

It looks queer in these times to see a man trying to make duplicate parts without jigs. I have a vivid recollection of a job of this kind which I had to do in a traction engine shop. The engine was thrown in gear with drivers by means of the old-fashioned three-tooth clutch. The job was the planing up of about twenty of these clutches for stock. The foreman gave me a sort of an excuse of a jig, which, although it helped to hold the job, was absolutely useless for accurately spacing the teeth. The job is shown at Fig. 1, and the jig at Fig. 2. The work was to be planed by means of a side tool on the line *a b*, Fig. 1. The way I was compelled to do it was to first fasten Fig. 2 to the planer by means of a couple of bolts in the notches. Then I had to put the work on the boss *c* and clamp it to the planer. After one face had been

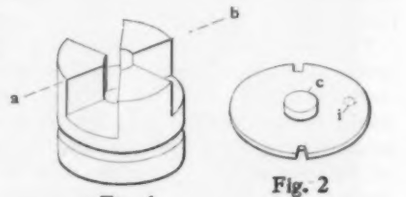


Fig. 1 Fig. 2

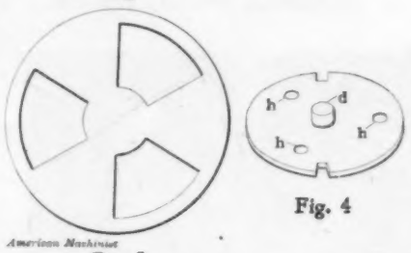


Fig. 3 Fig. 4

A JIG FOR PLANING A CLUTCH.

planed, the work was unclamped and turned about on the boss *c*. Then by a cut-and-try method the next cut was started so as to make it correspond to the sheet-iron templet, Fig. 3. The clutches made by this method nearly always had one tooth slightly larger than the rest. Consequently, the clutch drove with only one tooth. I asked the boss to let me make another part of the jig similar to Fig. 2, but larger. This part, shown at Fig. 4, was to be clamped to the planer bed and a hole drilled in Fig. 3 to fit snugly over the boss *d*. Three holes *h h h* were to be drilled in Fig. 4, 120 degrees apart, and a similar hole in Fig. 2 at *i*. The holes were then to be reamed to fit a taper pin. The work could then be clamped to the piece Fig. 2, and after the first face had been planed, it could be rotated and the pin inserted in the next hole. Such a jig would have shortened the time necessary to finish the job, and at the same time have made all the clutches alike. But the boss wouldn't listen to my scheme. He had always planed the tooth faces with the old jig and he guessed it would do. It is needless to say that that boss got no more suggestions from me.

The jig question is a study of itself. The jig is as important a factor in a shop turning out new work as is the milling machine. I always proceed on the assumption that there is no job for which some kind of a jig cannot be devised. There are lots of jobs which necessitate a good bit of thinking before reasonably reliable jigs can be designed for them; but perseverance in the right direction will overcome the obstacle at last.

NED WILSON.

Special Tool for Reaming Stud Holes.

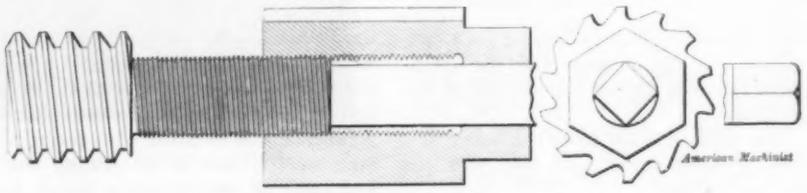
Editor American Machinist:

The accompanying sketch shows a tool which has been used to advantage for counter-boring or reaming stud holes which required a high degree of accuracy not obtainable by the old method of drilling, counter-boring and tapping. The stud bearing and the thread demanded, as near as possible, a perfect alignment with each other. The threaded holes were large sizes of U. S. Standard pitch.

Referring to the sketch, the long stem and threaded pilot were made in one piece, with a fine pitch thread above the pilot for feeding down the reamer, which was made after the pattern of the regular shell reamer, except the thread inside to fit the fine pitch thread on the stem. The shank or upper end of the reamer was milled hexagon to fit on a wrench. After entering the coarse threaded end of the pilot in the tapped hole the reamer can be fed down to the required depth. The reamers and stems were all made interchangeable for three or four sizes, and the tool gave good results.

D. E. MCCARTHY.

East Pittsburgh, Pa.



A TOOL FOR REAMING STUD HOLES.

Bending Articles in Punching.

Editor American Machinist:

There have been shown lately in your columns several kinds of punches, each of which may be the best for its own line of work, for each job is a law unto itself. In designing a punch, it makes a difference whether the punch is to punch out a few hundred or a few thousand pieces. The kind, thickness and hardness of the metal must also be considered. Many die-makers fail in one point. They do not shear their dies, because it seems to be a waste of

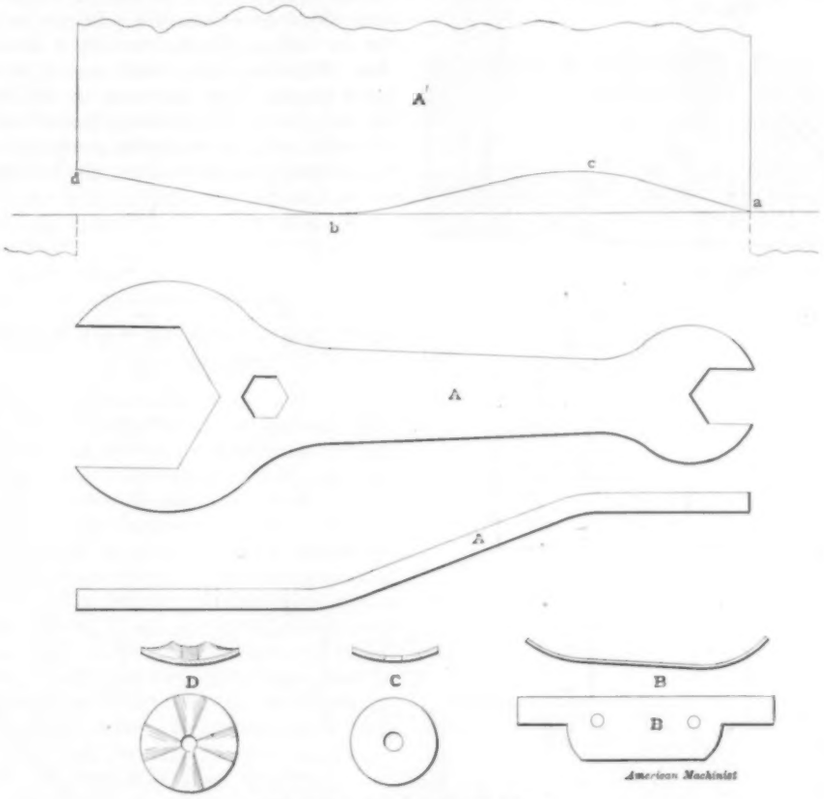
die, and causes the punch to enter the die farther. It pays, however, in everything but small dies.

In work that is to be formed by a second operation, shearing the punch often gives much better results than shearing the die, and the desired bend can often be obtained in this way with only one operation. I send you sketches of work finished in this way, the work being done in an ordinary two-punch leading die. *A* is a wrench which was formed by shearing the punch *A'* to the form shown. The points *a* and *b* strike the die first, and the points *c* and *d* are held back by the die, causing the wrench to take the form of the punch. *B* is a spring, the middle of which was punched first. *C* and *D* are cupped washers, *D* having four corrugations. The punches were finished to the shape required, with allowance for the spring of the metal. C. H. WILCOX.

Unmechanical Mechanics.

Editor American Machinist:

Among the most interesting things in the mechanical line that I have come across lately are the three little cuts that I enclose, and which I cut from the columns of a paper that I got hold of a day or two ago. The article from which they



PUNCHING AND BENDING WORK.

are taken is signed "Mechanic," and it professes to tell mechanics how to do several things, so that it is about as mechanical an article as a fellow is likely to get hold of. I don't often let these mechanical articles pass without noticing them, or, what is about the same, they don't often let me pass them without being noticed, and this one got a specially firm grip.

Fig. 1 is not a gasoline lamp for a circus tent, as some might suppose, but is a steam pipe for heating air-pump cylinders for shrinking in new bushings. "This device," it says, "consists of a home-made arrangement of perforated pipes arranged to discharge steam jets against the cylinder walls. It can be made from ½ to ¾-inch iron pipe and the connections made with T-unions. The round pieces *D, D* can be bent on a wood form after filling the pipe to prevent its buckling. Rosin is a good filler for the work. After bending the pipe, the threads are cut and the connections made with each other and with the feed pipe by means of the main *B* which joins the circles by straight pieces *C, C*. The main *A* connects with the steam supply with a hose or other form of flexible pipe. The device is pushed into the cylinder, the steam let in, and after the cylinder is expanded, the device is withdrawn, the bushings fitted, and the cylinder allowed to cool, resulting in a tight fit."

The thing shown is evidently not home-made, or anywhere-else-made, as it would be impossible to make it or to put it together, following either the sketch or the description. And even if the thing could be made and used, there is a much better way of steam-heating such a cylinder for such a purpose. Make two thick wooden heads or covers, placing one at each end of the cylinder and holding them in place by a large center bolt running right through

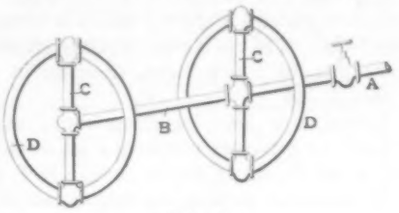


Fig. 1

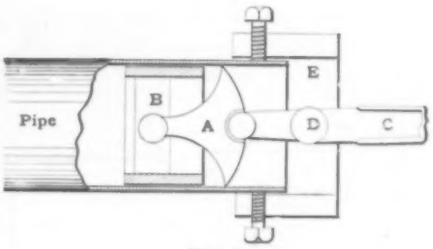


Fig. 2

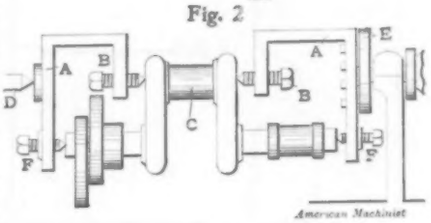


Fig. 3

SOME MECHANICAL (OR UNMECHANICAL) PUZZLES.

both heads. Don't bother about making the heads perfectly steam-tight. Stand the cylinder upright and turn steam into it by a pipe screwed into the top head, letting the water leak out below. In about five minutes the cylinder will be splendidly cooked. Turn off the steam, unscrew the center bolt and take the wooden heads out of the way. Then, having the bushing suspended all ready, you just lower it into the cylinder until it rests upon stops provided below, or, if it is to come flush with the end of the cylinder, until it rests on the same support with the cylinder, and in a few minutes it will be perfectly tight, if the sizes are all right. I have assisted at this operation a number of times, and it was always perfectly successful.

Fig. 2 is " a very simple form of cutting tool" for cutting off the end of a piece of pipe from the inside. *A* is the tool with its points in contact with the pipe at the line where it is to be cut off, and it is operated by the lever *C*. "This cutter,' so the description says, "can be made from tool steel. The cutting tool is pivoted on a bar *B*, and the latter is a part of the shell or tube which supports the affair. This tube bearing is cut out from common seamless steel tubing and the diameter corresponds with the inside diameter of the pipe to be cut. The lever *C* is studded to the frame piece *E* at *D* and affords a good chance to get a purchase readily. The frame piece is adjusted over

the end of the pipe, set-screwed to insure steadiness, and pressure applied by hand to the lever, thus bringing one of the cutting edges in contact with the interior shell of the pipe while the device is slowly revolved. The cut is made entirely around the pipe in a few turns, resulting in a smooth end."

Now, how does the thing work, anyway? If *E* is held fast by the set-screws, how do *C* and *A* and *B* turn? If *E* is not held from turning, but only "steadied," by the set-screws, what happens when, besides the turning of *C*, it is pried over to give cut to *A*? What is the use of two cutting points to *A*? What is the use of the whole contraption? I give it up.

FIG. 1. BEFORE AND AFTER BENDING.

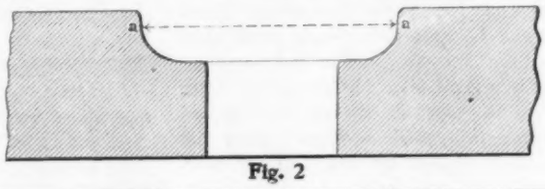


Fig. 2

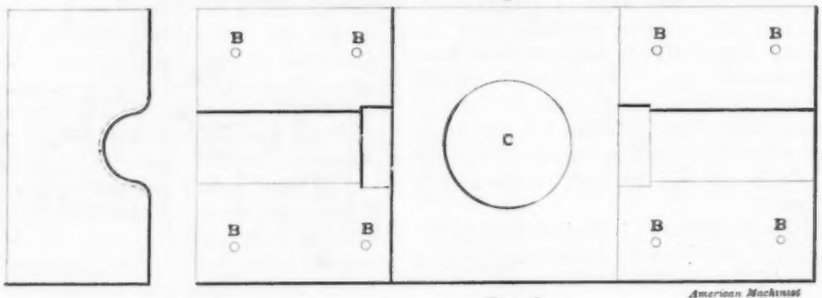


Fig. 4

Fig. 3

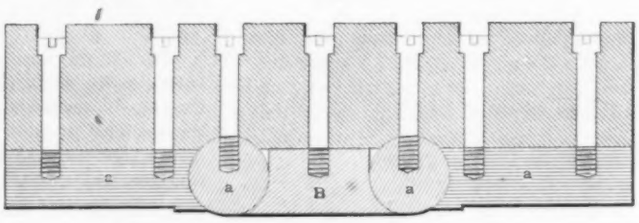


Fig. 5

FORMING DIE AND PUNCH FOR BICYCLE JOINT FERRULES.

Fig. 3 speaks for itself. This is a rig for turning the crank-pin of a solid crank-shaft, and the following is the description: "Two iron parts *A, A*, forged from bar iron, form the turning frame, one side of which is bolted to the face plate of the lathe at *E* and the other is provided with a center as at *D*. The ends of the crank-shaft are centered with centering screws, which are tapped into the lower legs of the frames, as at *F, F*. The turning center of the wrist pin *C* is lined with the screws *B, B*, which are threaded into the short arms of the frame pieces, as shown."

What is to hinder the crank-shaft from dropping out of the lathe by its own weight when turned over to a horizontal position? These things overcome me with lassitude and fatigue. I present them merely to show "American Machinist" readers what kind of stuff is sometimes served up in so-called mechanical journals, journals whose editors probably scarcely know a machine shop from the Chilcoot Pass.

MORRIS FULTON.

Philadelphia.

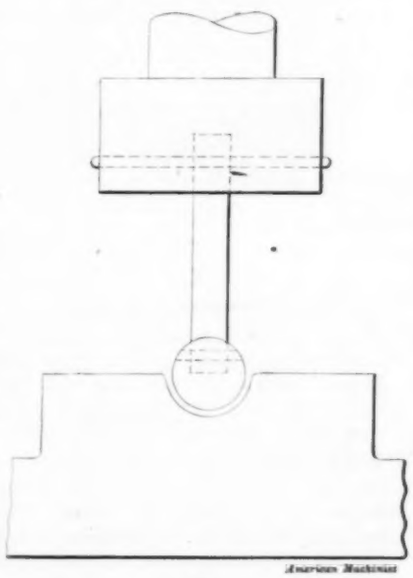


Fig. 6

BENDING DIE.

Making Joint Ferrules.

Editor American Machinist:

When making dies for forming joint ferrule, Fig. 1, out of sheet steel, I have often been asked by fellow employees how the length is determined in that part of the break-down die which forms the main part of the ferrule. In order to make this clear, and to give to the readers of the "American Machinist" a simple rule that I always use when laying out a set of these dies, I send sketches of the different operations that I think will be sufficiently plain.

Fig. 2 is a section of the break-down die; Fig. 3 is a plan; Fig. 4 an end elevation. In Fig. 2 the distance at *a a* is obtained as follows: Multiply the diameter of the hole in your sample by 3.1416, divide the result by 2, add once the diameter of the hole and twice the thickness of the stock you desire to use; the final result will be the distance to work out the die.

A block of tool steel, which has been previously planed true, should be fastened in the swivel vise of the milling machine, and the different circular portions bored by an ordinary cutter held in a boring bar. The rest of the work can be done on a shaper. Any angle can be obtained by the use of the graduated swivel vise. Ferrules with acute angles generally require two break-down dies, the first one

Fig. 7

THE CLOSING DIE CLOSED.

with corners, where the branch joins the main part, extensively rounded.

B B, Fig. 3, are holes for gage screws. *C* is a hole for knockout, but operated in a press with a cam attachment. Care should be taken to produce a perfect blank before making the cutting die, and also to properly locate the work; for trimming or filing the edges before passing to to the next operation is unnecessary.

Fig. 5 is a view of the punch, which is bored somewhat like the die, the circular bearings being only about ⅛ inch deep in the large ones and correspondingly so in the others. The round pieces *A* are turned to size, and held in place by two screws in each part. The block *B* filling in between the round pieces must fit perfectly, as it keeps the two pieces from being forced out of position and closed together.

The second forming operation, Fig. 6, is to strike the material in the middle, after it has passed through the breakdown die, and bend it to as near a closing position as is possible The essential features of the die and the method of operation will be readily understood by reference to the sketches.

Fig. 7 is an exterior view of the closing die. The two parts, the punch and die respectively, are doweled together by two pins that are not shown in the sketch, and bored to the required dimensions. About 1-64 inch should be planed from the faces of the two parts, an equal amount being removed from each. This will allow the punch to come down hard on the work without coming in contact with the face of the die. Arbors must be used in the closing operation if perfect work is desired.

DIE MAKER.

Lynn, Mass.

Special Tools for Setting and Holding Work.

Editor American Machinist:

The setting of work on machine tools is quite an item in the time book. A man may set a large engine frame, or some similar piece, in one-half the time, with a few tools properly designed, that he could with some of the older traps, clamps, shims, etc. The dollar is what we are all after. The proprietor of the shop says to his officers, "I am not particular as to all the small details in your methods; but if the dollar does not come, there must be something wrong." Now in the design of special tools we can waste a good many dollars, and the tool will do no more work for the extra dollars put in.

A good many years since, we had a job to build a very large machine, and the man that had it in charge was to give us instructions as to how much finish we should put on, and, in a general way, how the work must be turned out. Some of the "jours" seemed to think there was a great waste of time on the job, and while they talked it over among themselves they became curious in regard to the matter, and one of them says to the designer: "Why do you put so much extra work on these parts?" "Oh," he said, while he winked the other eye, "I expect the men here in a week or so that are putting up the chink, and I am so far behind with the job that I must polish as much as possible, so that they will see what a lot of work we are doing." So in designing

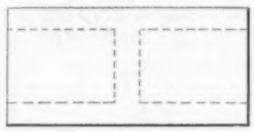


Fig. 1

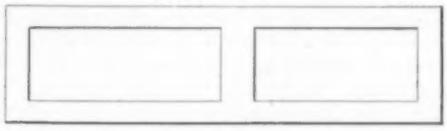


Fig. 2

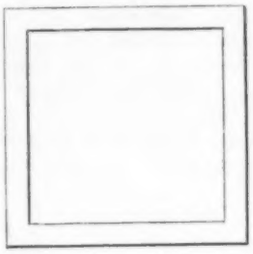


Fig. 4

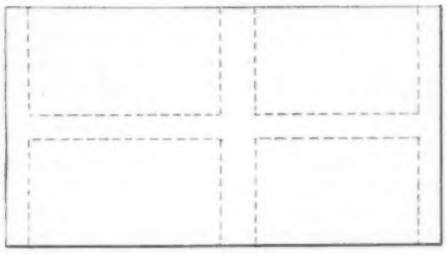


Fig. 3

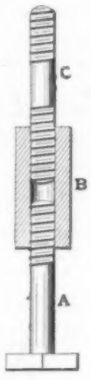


Fig. 5

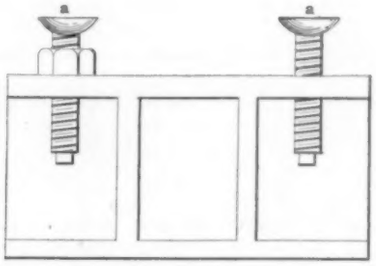


Fig. 6

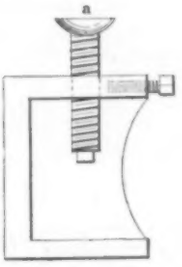


Fig. 7

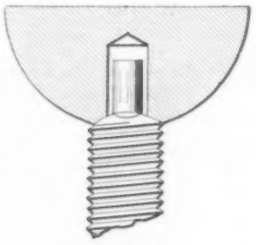


Fig. 8

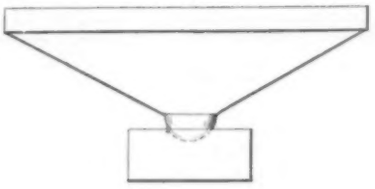


Fig. 9

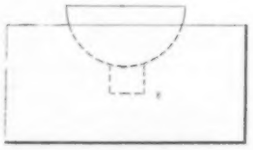


Fig. 10

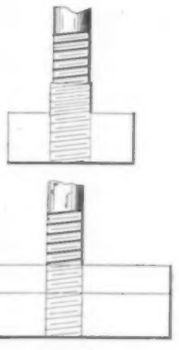


Fig. 11

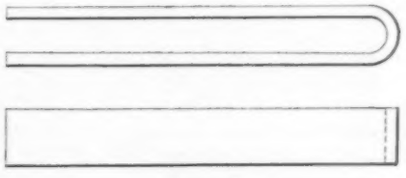


Fig. 12

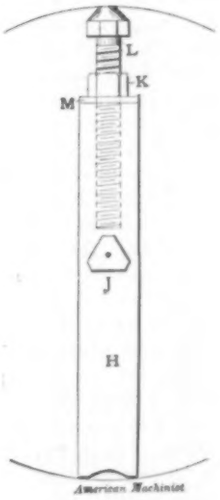


Fig. 13

SPECIAL TOOLS FOR SETTING AND HOLDING WORK.

special tools, we may waste lots of dollars for the boss, and with no credit to ourselves.

The first that we shall take up, of the tools here shown, will be the cast-iron parallels, Figs. 1 to 4. Fig. 4 is a square, box-shaped piece that has a core through it, and is of a type used very extensively in shops of the present day, as well as the older ones. In the first place, the pattern, with the core box, is quite expensive. Then there is the core to make, and the coal used for baking, setting the core, and after the casting is made, getting it out. Now if we make it as shown in Figs. 1, 2 and 3, there is no core, and the shape is better for use in the shop, as it is easier to handle, and clamps may be put on more readily.

While we are on the subject of clamping, it will be in order to say a few words about bolts and clamps. The first, and worst, trouble about bolts with clamps is that, as a general thing, men do not have enough of them. Then another is that a good many men will throw the bolts, nuts and straps all in the same box together, and in many cases the nuts will be off the bolts. The trouble begins when they want a dozen or so bolts and clamps for a job in a hurry. How much better it looks to have a rack where the bolts may hang in plain sight, so that a man can see at a glance what he wants. Then the style of bolt is of importance. It is very often the case that we may see a piece of work clamped on the planer with bolts standing up from 6 to 20 inches above the clamp with a lot of old nuts and washers to fill up. And it sometimes happens that, after the work is clamped down, the bolt will stand up so high that it is necessary to raise the cross head of the planer to clear it, or take the bolt out and hunt for a new one. The case is more aggravated when this bolt happens to be located in the center of a piece of work where it cannot be removed without disturbing the whole job, or sawing off the bolts and, with a hand die, cutting a new thread. This is often what makes a job cost, and the boss says, "We have lost money on it." But it sometimes happens that the boss is at fault.

Now, to get over a whole lot of this trouble, the style of bolt shown in Fig. 5 will answer. The bolt proper is very short, and may be slipped in under a job on the planer, or by having the head flattened on two sides, it may be put down through the work, dropped into the slot in the table, turned partly around, and it is ready for the hexagon coupling shown at *B*. Then by using the studs marked *C*, we may have any length required, and with very slight expense, as a boy can cut them in an ordinary bolt cutter, from odds and ends of round iron. The bolt *A* may be made in a turret lathe or forged in the smith shop. The former is preferable, as it makes a stronger head.

Another very handy planer tool is shown in Figs. 6, 7 and 8, 8 being an enlarged view of the swivel on the top of the bolts. These blocks may be of any hight and other dimensions desired. I have had them in use many times, and found them all that was needed for the purpose. The work may be adjusted to a nicety by the screws, and the swivel top will adapt itself to the uneven surface of a rough casting. The diameter of the screw of course should be to suit the weight that is to rest on it. For planing heavy engine frames a 1-inch screw, if not too long, will answer. Sometimes a set screw, as shown in Fig. 7, may be required, to prevent the jarring loose of the large screw. A lock nut might be used, as shown in Fig. 6, under the swivel top *a*, for rough work; but it is not as safe, for fine adjustment, as the set screw, as it is apt to alter the hight of the screw when screwed snug.

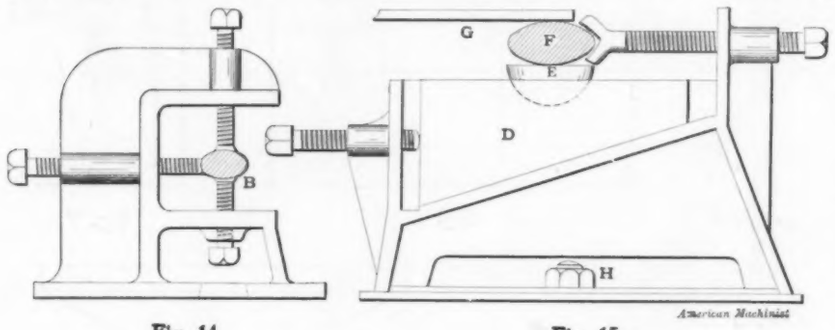


Fig. 14 Fig. 15

FOR HOLDING FLY-WHEELS.

Figs. 9 and 10 also are good tools for resting heavy work on, as the swivel will find its bearing when the casting has not been trued up. A piece of heavy cardboard is a good thing to place on the top of the swivel, as it holds better than two iron surfaces. The straps shown in Fig. 12 are made from bar iron, and, as they stand edgewise in the work, are very strong; and further, they may be removed by merely slacking the nut. Except in some special cases, they are far preferable to the old-style flat straps with holes drilled in them. The long nuts shown in Fig. 11 are very convenient, as they may be inserted in the slot of the planer table, and the studs shown at E, Fig. 5, used for any length required. The nuts are very cheaply made, either on a planer or milling machine, from a bar of mild steel. Where they are made in quantities, it is well to have a small jig for drilling and tapping, so that the holes will come in the center of the tongue.

Fig. 13 is a time-saver used for setting cylinders on a planer. *H* is of ordinary pine, cut out fork-shape on the lower end, and has a hole in the top for a bolt *L*. *K* is a lock nut and *M* a washer. We take the tool, place it in the bore of the cylinder, adjust the screw so as to hold the wood firmly; then put in a pieee of tin *J*, fastened to the wood by bending small corners on three sides and driving them in, so that the center of the tin will be in the center of the cylinder, approximately. Then with dividers the man may readily find the exact center. There should be a number of the pieces *H* of different lengths to suit different diameters of cylinders.

Figs. 14 and 15 are principally for setting fly-wheels on boring and turning mills. In 14 *B* represents the arm of the wheel held firmly by the three screws. The two vertical screws are for setting the wheel, and the horizontal one is principally for driving. There should be three or four of these for small-size wheels, and possibly more for large ones, where there is more than one cut on at a time. Fig. 15 is for a similar purpose, and it may be used also for setting work on a planer. The vertical adjustment is made by means of the wedge-shaped piece *D*, and the screw shown at the large end. *E* is a swivel on which the arm *F* rests, and *G* is the clamp for holding the wheel. The fork-shaped piece is for driving, and is made with a swivel to fit the end of the screw, as shown.

H. S. Brown.

Easton, Pa.

Giving Credit for What is Done.

Some of the good things that are brought out at the annual commencements and reunions of alumni are altogether too good to be lost, but they are usually lost all the same. We take pleasure in saving the following, which is from a speech by John C. Underwood, ex-Lieutenant Governor of Kentucky, at the alumni banquet of the Rensselaer Polytechnic Institute:

"The first great lesson that I learned in engineering in life has been of the greatest importance to me. I was a first lieutenant of regular engineers in the confederate army. I was a lieutenant coming fresh from the school that I loved, having been captain of the division when we surveyed. I thought there was very little I didn't know about engineering. It didn't take me long to ascertain that so far as the practical work was concerned, some of the Irishmen working in the ditches that I had charge of knew a great deal more than I did. At the same time I had common sense enough to keep those thoughts to myself, and I soon learned what they knew, and I felt as though I

knew it originally. That was the lesson of my life. I was sent out with my commission scarcely wet and scarcely dry, and I had the privilege of building a little redoubt on the line of our defense, and, as the attack was not made immediately, I borrowed some scythes from the old farmers close by, and, by telling them Kentucky stories, I induced them to work—for they don't like to work under Southern skies—and I mowed off the grass. So on a beautiful May or June day it had grown just so long as to make a pretty swath. The general of division came along there one Sunday morning. I had the privilege of standing to the right of the line. He stopped within 20 feet of where I was standing and turned to the lieutenant-colonel and complimented him upon the work done there. The lieutenant-colonel had never been on the line and didn't know there was a little redoubt on the left. Among other things, the general said: 'I admire the way in which you caused the parapet to be mowed. It brings about an *esprit de corps* with that branch of the service and with the men that were within.' The lieutenant-colonel never said, 'This is the man that did that work,' and when the men were marched to quarters I walked down the line, and, like the Dutchman's boy, thought 'damn,' with the 'D' very large. I walked down about a mile and had on my best suit of clothes—we never had but one suit of clothes, and that didn't last long—and I knelt down in the corner of a rail fence, and when twenty-two years of age I took an oath that if I got through with that war, in whatsoever position I should be placed in after life, no matter who should come in contact with me and was deserving of praise, be he man, be he devil, be he angel, be he woman—I should have placed the woman first—that I would give every jot and tittle of the right that he was entitled to, and, so help me God, I have carried it out.

"Gentlemen, that is the best part of engineering. Cheat no underling of anything to which he is entitled. By building him you build yourself."

Technical Publication.

The rapid growth of general interest in maritime matters and naval affairs since the war with Spain, and the fact that the shipyards of all the coasts, as well as the great lakes, are filled with work for two or three years to come, have contributed to make the 1899 edition of the "Blue Book of American Shipping," which is just from the press, an apparent justification of the publishers' claim that it is the most valuable work on shipping ever issued in this country. The Blue Book, known as the only marine and naval directory of the United States, is this year more handsomely illustrated than ever, and is in more handy form. It is not only a book of reference for the shipbuilder, shipowner and naval architect, and the merchants and manufacturers who have dealings with these interests, but it contains also a hundred or more pages devoted to statistics of water commerce and to general information regarding the merchant marine and navy. Among noteworthy features is a comprehensive history of the year in everything pertaining to the construction and navigation of vessels. The directory part of the publication contains particulars of American steam and sail vessels, with names and addresses of owners, separated as to coasts, Western rivers and great lakes; lists of shipowners, ship and engine builders, naval architects, marine engineers, vessel masters, and members of various organizations made up from the navy and merchant marine; particulars of vessels of the United States Navy; heads of government bureaus in the United States and Canada connected with shipping; steamship lines—including those operating to foreign ports—with details of service, principal officers and names and addresses of managers. The Blue Book is published by The Marine Review Publishing Company, Cleveland. Price $5.

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant; see p. 16.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer.Mach.T.Co.,Meriden,Ct.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," price $1, post paid. J.L.Lucas,Prov.,R.I. Send for index sheet.

"Brandt's Triple Expansion Gaskets" are the best for boilers. Randolph Brandt, 38 Cortlandt st., New York.

Wanted—A hydraulic press, 150 tons capacity; yoke capable of taking 12-in. shaft; distance between ram and yoke, 24 ft. Box 88, AMERICAN MACHINIST.

Bound volumes of "American Machinist" for 1893 and 1894, cloth, good condition, $3 each; one of 1888, morocco, $4. "Volumes," care AMERICAN MACHINIST.

Gear and milling cutters, adjustable reamers and special tools; vertical millers, cutter and surface grinder and shears. Catalog of small tools free. R. M. Clough, Tolland, Conn.

The Waltham Machine Works, Waltham, Mass., make a specialty of accurate work. Correspondence in regard to small automatic machinery, punches and dies, etc., is solicited.

The works of the National Water Tube Boiler Co., at New Brunswick, N. J., together with all its valuable patents, will be sold by the receiver on July 19. See notice in another column.

A Good Opportunity.—For Sale—Plant, consisting of a complete foundry and machine shop equipment, together with patents, patterns for a full line of flour-mill machinery and general ironwork. Address "A Good Thing," care AMERICAN MACHINIST.

Institutions retiring from business having machine tools, brass or wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

For Sale—One 15 H. P., 10x12, 150-revolution, O. K. Rider's patent engine; one 30 H. P., 9x20, 200-revolution New York Safety engine, and one 45 H. P. 10x20, 110-revolution Twiss patent engine; the above engines in first-class condition, and can be seen running at Kennedy Valve Mfg. Co., Coxsackie, N. Y.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisement under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Experienced draftsman wants position. Box 91, AMERICAN MACHINIST.

Technical mechanical draftsman, 5 years' experience. Box 99, AMERICAN MACHINIST.

Superintendent of large gas engine works desires a change. Box 69, AMER. MACHINIST.

Experienced mechanical draftsman, technical graduate, having shop experience. Box 98, AMERICAN MACHINIST.

Tool-maker on any kind of punches and dies, also fine interchangeable tools; large experience. Box 95, AMERICAN MACHINIST.

Frenchman seeks situation with firm for Paris Exhibition; 26 years' experience on tools and machinery. Box 93, AM. MACH.

Tool-maker and all-round machinist, gear-cutting universal miller; experience as foreman. Address Box 84, AMERICAN MACHINIST.

Situation wanted as representative abroad, to sell American machinery, by experienced German-American. Box 90, AM. MACHINIST.

Situation wanted by a first-class tool and gage maker; has the best of references and 15 years' experience; also model work. Box 102, AMERICAN MACHINIST.

Assistant superintendent will change; cost-reducing and estimating on work of any class a specialty; American, age 34; 15 years' experience. Box 100, AMERICAN MACHINIST.

Technical graduate, of 12 years' experience in shop and college, at present instructor in technical school, desires position as instructor, foreman or draftsman. Box 83, AMERICAN MACHINIST.

Position wanted as superintendent or head draftsman by a first-class mechanical engineer; 24 years' wide and varying experience in office and shops; best references furnished. "Executive Ability," Box 87, AMER. MACH.

A first-class draftsman, who is a pattern-maker by trade, desires a change about July 15; experienced on general machines, punch and shears, machine tools and automobiles; best of references. Box 86, AMER. MACH.

A tool-maker with several years' experience as foreman of tool-room and general repairs in large factory, desires to make a change; is good manager, as references will show. Address Box 96, AMERICAN MACHINIST.

An up-to-date, practical man of 27 years' experience, desirous of making a change, will be open for engagement as superintendent or general foreman for progressive machinery manufacturers after August 1. Address Box 80, AMERICAN MACHINIST.

A practical mechanic with 11 years' experience in shop and drawing room and 5 years in business office, believes he could be of value as superintendent or assistant manager of a good machine business; can handle advertising, systematize office and handle men. Box 92, AMERICAN MACHINIST.

Practical machinist and draftsman, now holding position as general foreman in shop employing 60 men on steam and gas-engine work, desires a change; can furnish excellent letters of recommendation from past and present employers. Address Box 94, AMERICAN MACHINIST.

Help Wanted.

Draftsman for marine and dock work. Address, with full information, P. O. B. 1815, New York.

Wanted—Machinist as foreman; control about 25 hands; give references. Address De Loach Mill Mfg. Co., Atlanta, Ga.

Wanted—First-class drop-forge men, accustomed to gun and bicycle work. Remington Arms Company, Ilion, New York.

Wanted—Experienced mechanical draftsman on electric generators and other electrical apparatus. Address, with full particulars, Box 97, AMERICAN MACHINIST.

Wanted—Draftsman, experienced in boring and turning mill design; preference to one who could join in construction plant on modern lines as specialty. Address Box 63, AMERICAN MACHINIST.

Wanted—Foreman for iron foundry (short distance north of New York city) making

(*Continued on page 40.*)

Obituary.

Joshua Gray, a well-known and prolific inventor, died at Medford, Mass., June 25; seventy-five years old. His inventions covered a wide field, embracing firearms, sewing machines, railway appliances, boilers and the rubber-top lead pencil.

Francis H. Morgan, treasurer and general manager of the Morgan Spring Company, Worcester, Mass., died in that city, June 19; sixty-six years old. He was born at Clyde, N. Y., and his first machine-shop work was at Clinton, Mass. The Morgan Spring Company was established about thirty years ago.

The following rather interesting advertisement recently appeared in an English newspaper: "Wanted—A gas engineer-driver; wages, 20s., rise 25s., with cottage. He must be a fitter, electrician and gas engineer, to look after a small boiler and generator. The hours are 70 per week, and on Monday 15 hours would have to be put in without time for meals. He would have to look after the dynamos and accumulators, and all the lights throughout the mill. He will also be required to take charge of a gas engine and pumping plant, and to keep the water intake clear of weeds."

All of our chalk comes from England, from the banks of the Thames. Between 175,000 and 180,000 barrels of it are consumed in the United States annually, and not all of it in the machine shops for truing up work. The most extensive users of it are the rubber factories, and the next are the putty makers. It does not come to us in its crude state, but is first ground and washed.

Manufacturers.

Gould & Eberhardt, Newark, N. J., are reconstructing and adding to their plant.

The American Tobacco Company, Richmond, Va., are enlarging their plant.

John F. Fleurant has been awarded the contract to build the addition to the Guerin Spinning Mill, Woonsocket, R. I.

Hersee Bros., of Roslindale, have just completed a new addition to their new factory on Perkins and Station avenues in Campello, Mass.

Work has been commenced on laying the foundation of the new power-house to be built at Byfield, Mass., for the G., R. & I. road.

J. W. Ferguson, architect, of Paterson, N. J., has just completed plans for an addition to the ribbon factory of Bamford Bros. This addition will be 117x110 feet.

Extensive improvements are to be made at the Cramps shipbuilding yard, Philadelphia, Pa. The acreage of the plant will be more than doubled by the purchase of adjoining land.

(*Continued on page* 41.)

Help Wanted—Continued.

light and heavy castings, dry sand and loam work; permanent position to the right man. Address "Rensselaer," AMER. MACHINIST.

Wanted—Machinists who have had experience on high-grade machine work; if you are not accustomed to accurate work, do not answer; state experience, age, wages, references and address. Leland & Faulconer Mfg. Co., Detroit, Mich.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite applications from draftsmen, pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

Superintendent—A company building high-class automatic steam engines wishes to engage an educated and capable mechanical superintendent; must be expert in modern design and methods of construction. Address, with full information, Box 78, AM. MACH.

Wanted—Foreman for the brass department of a manufacturing establishment, to take charge of 20 to 25 men; must be thoroughly up to date in the best practice, understand the making of tools, etc.; state age, experience and salary expected. Box 101, AM. MACH.

Wanted—A young man as foreman by firm manufacturing machine tools, located in the Middle States; must be able to handle men and thoroughly familiar with up-to-date machine-shop practice; married man preferred; give age, experience, references and salary expected. Address Box 79, AMER. MACHINIST.

Wanted—An up-to-date assistant superintendent for machine shops near New York, employing 300 men, doing first-class work; one who can introduce piece system and improved methods of manufacturing; state experience, age, references, salary expected, to insure answer. Address Box 89, AM. MACH.

Wanted—An intelligent, technically educated machinist of independent judgment, thoroughly experienced in the construction and assembling of fine automatic machinery, to act as an inspector; state age, line of machinery heretofore associated with and how long, and give references, which must be first class; liberal salary paid to the right man. Address Lock Box 707, Washington, D. C.

CLEVELAND GEAR WORKS

W. R. SAWYER, Lessee.
86 Seneca Street,
CLEVELAND, OHIO.

Gear Wheels and Gear Cutting
Of all descriptions.
Get Our Prices.

REDUCES OIL BILLS 50%

or more—that's what the Cross Oil Filter does. If it doesn't, send it back. Capacities 3 to 150 gals. per day. Saving money for its users in 23 countries.
Testimonials from the leading firms in every field of industry.
THE BURT MFG. CO.,
AKRON, OHIO, U.S.A.
Largest manufacturers of Oil Filters in the world.
Sent on Approval.

NEW Water TOOL GRINDER
High Grade. Low Price.
EMERY WHEELS and GRINDING MACHINERY
SAFETY EMERY WHEEL CO.,
CATALOG 8. Springfield, Ohio.

We Have No Pet Schemes
to ring in, in the building of special machinery—no hobby except to build it so it will bring success to its owner and credit to ourselves. . . . . This is a safe place to send your work of that character, whether for building alone, or for designing and building. Let us hear from you. . . . . .
A. FALKENAU,
Engineer and Machinist,
109-115 No. 22d St., Philadelphia, Pa.

Receiver's Sale of Important Manufacturing Plant.

By order of the Court of Chancery I will sell, beginning at Two P.M., on
Wednesday, the Nineteenth Day of July,
at the premises known as the Factory of The
NATIONAL WATER TUBE BOILER CO.,
at the corner of Neilson and New Streets,
NEW BRUNSWICK, N. J.,
ALL THE
MACHINERY, TOOLS, PATENTS, FRANCHISES AND PLANT
of the said The National Water Tube Boiler Company, as follows:

1. All the patents, patterns, flasks, drawings and records used in the manufacture of the National Water Tube Boilers, and all special machinery, jigs and tools used in such manufacture, and also the trade name and good will thereof.
2. The patents and all patterns, drawings and records used in the manufacture of the "Standard Shaking Grate," and the trade name and good will thereof.
3. The General Machine Shop and Foundry equipment, lathes, planers and shapers, drill-presses, vises, cranes, cupola and blower, general jobbing shop patterns, core boxes and flasks, including the patterns of all the rubber machinery, pumps and marine railways manufactured by the National Water Tube Boiler Company, and its predecessor, the National Iron Works, W. E. Kelly, proprietor.
4. The patterns and templates for brick making machinery as used in all yards in this vicinity.
5. All pig iron, scrap iron, wrought iron, bar and sheet steel, brass and general machine shop and foundry supplies.

Lists of machinery will be furnished on application.
The terms will be 25 per cent. of the purchase price in cash at the completion of the sale the balance to be paid upon the delivery of the goods.
HENRY G. PARKER,
Receiver of the National Water Tube Boiler Company.

TOOLS FOR MACHINISTS
The Starrett No. 9 Combination Square.
Send for our Catalog of Machinists' Tools. The Starrett and Brown & Sharpe specialties.
Hammacher, Schlemmer & Co.,
209 BOWERY, NEW YORK.

Emery and Corundum Wheels and Grinding Machinery. Emery and Corundum in Bulk. Write for Circular C.
Hampden Corundum Wheel Co.,
Brightwood, Mass.